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APRIL 2015 | VOL. 45 ISSUE 04

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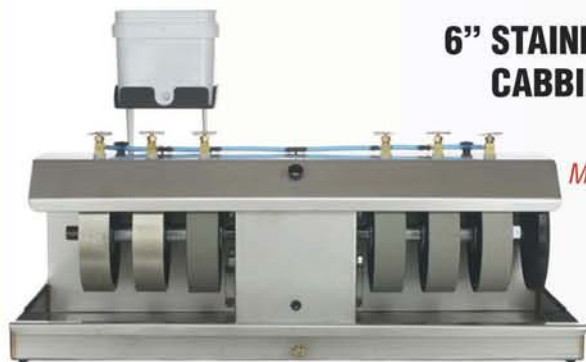
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3-0333	1200	85.00	72.25
3-0334	3000	85.00	72.25
3-0335	Set of 4	289.00	---



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Rock&Gem

Volume 45, Number 4

April 2015

ON THE COVER

The Munich Show features the best minerals from Europe and around the world. This crystallized rhodochrosite is from Uchucchacua (Lima Department), Peru, and stands 3.5 cm high. (Jeff Scovil photo/Luis Miguel Burillo Minerals specimen)

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Rock Collections for Community Colleges

The recently opened, world-class Perot Museum of Nature and Science includes an extensive rock and mineral collection (www.perotmuseum.org). Some colleges and universities also have mineral collections on public display in their science or geology departments that are labeled with detailed information. These are from commercial suppliers that specialize in the educational market.

Readers may want to donate specimens to their local community colleges. These institutions are a vital part of higher education, yet are faced with severe budget cuts. Collectors could offer valuable expertise to both instructors and students.

Some two-year colleges have programs in lapidary or jewelry making, and a number of them have programs related to geological sciences or the petroleum industry, so collectors with this special expertise could offer valuable insight on how the geological analysis of rocks applies to petroleum exploration.

Collectors who make donations could arrange the collections according to rock type, industrial or consumer use, or region of the country.

—Glen W. Spielbauer
Dallas, TX

A Crystal

There was a time when I would see, a part of nature's geometry,
I'd sit and stare, without a thought, of how the light reflected off,
But little did I know back then, of the complexities held within,
The minerals that I would hold, their tales as precious as pure gold.

The first was quartz, oh what a joy, silicon and oxygen, does not annoy,
Six sided with a point on high, hexagonal, and that is why,
This crystal looked so cool to me, doubly terminated gave more to see,
Though sceptered seemed the best of all, a kingly sight in any hall.

The next was beryl, six more sides, green ice cubes for eyes to ride,
Beryllium an important part, combining with an aluminum heart,
With oxygen and silicon too, a little chromium to finish the queue,
A flattened point, unlike quartz, did not seem to cut it short.

Then calcite came upon my midst, a gem much bigger than my fist,
Dog toothed, they called it to my amaze, it firmly held onto my gaze,
Calcium and carbon, with oxygen here, honey colored from an organic smear,
Scalehedron was the real name, a doubly terminated masterpiece in which to frame.

But many colors came to me, with a cubic mineral that I could see,
It's name fluorite, and what a rock, pinks, greens and blues make quite a flock,
Calcium returns to the scene, with the element that we call fluorine,
Cubes seem to be its major shape, but the octahedral form makes me agape.

But with the fluorite that I have found, another cube from out of the ground,
This more hard, and shiny too, a lot more heavy with a silver hue,
Lead it seems, has taken hold, of sulfur to make this rock of old,
Galena, the name that it now bears, spinel law is my favorite pair.

Then there is copper known to all, it makes such beautiful minerals,
Azurite, a nice deep blue, comes in many forms to view,
From cubes to points that look like spears, this carbonate will hold back tears,
Though over time, change it might, to its greener cousin, malachite.

Rarely crystalline, this copper rock, forms botryoidal shapes that seem to lock,
Bands of dark and lighter greens, sometimes polished to a brighter sheen,
But prized the most are cubes and spines, radiating out that look so fine,
And sometimes you will see a sight, a pseudomorph of azurite.

Nature has a wonderful way, to make beautiful shapes that seem to say,
That hidden deep within its depths, are sights that would just stop your breath.
To gaze upon such awesome sights, elevates you to greater heights,
So as I conclude this little poem, I look contently at my display at home.

—John Green

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LAPIDARY OF THE MONTH

I've been interested in the lapidary arts for most of my life, but didn't do much more than collecting different types of material until about four years ago. I purchased a slab saw and started slabbing the material I collected. After I joined the East Texas Gem & Mineral Society three years ago, my hobby really took off. I purchased some more equipment and started cutting and polishing cabochons. I have been wire wrapping for about two and a half years now, and I find it to be very relaxing and rewarding.

This particular pendant was about a year in the making. I normally use rough material that I have collected, but this special stone came from a dealer at our annual show. I picked it up after reading the article "Pietersite" in the January 2014 *Rock & Gem*, which came out at about that same time. The piece of pietersite was just big enough to cut into three small slabs. They were all nice, but the slab from the middle was perfect for this project.

I prefer to make freeform cabochons so as not to waste material, plus I think they look much more interesting. After shaping the cab, removing only as much material as necessary, I began the polishing process. I used two modified 8-inch cabbing machines with diamond wheels (11 total). The polishing process started with 280 grit and progressed through 600, 1200, 3000, 5000, 8000, 14000 and 50000. For the final stage, I used the flat lap with leather and cerium oxide. Then I had a beautiful cabochon ready to be wrapped.

The wrapping process took about nine months. Some of the procrastination might have been because of the beauty of the stone—I can't say for sure. When I wrap a cab, I always try to make the wire accent the cab, not distract from it. I finally committed to a design using five pieces of 21 gauge half hard square 14k gold-filled wire, with 22 gauge half hard half round 14k gold-filled wire for the binders.

Once I completed the wrapping process, I released the wires on the back of the stone, and removed the stone. I placed the wire wrapping in my 3-pound tumbler with stainless steel media and tumbled it for 30 minutes. This process helps to remove tool marks from the wire and hardens the wire.

After being removed from the tumbler, I washed the wrapping, blow-dried it, and reinstalled the stone. I started doing this when I noticed that some of my stones, especially the softer ones, didn't have as nice of a shine after being tumbled. It definitely was worth the wait, and my wife was very pleased to add it to her collection.

—Kinney Polve
Henderson, TX



Would you like to be named Lapidary of the Month?

To enter the contest:

- Write a 500-word step-by-step description of how you crafted your lapidary project from start to finish. Save it as a document file.
- Take at least one sharp, close-up, color digital photo of the finished project. Photos must be high-resolution (300 dpi at 4 inches by 5 inches, minimum).
- Attach your document file and digital photo (.tif or .jpg) to an e-mail and send it to editor@rockngem.com with the subject line "Lapidary of the Month".
- Make sure you include your name and street address (not a PO Box)



for prize delivery should your entry be selected for publication. Only winners will be notified. E-mail the editor or call (972) 448-4626 with any questions about these requirements.

Lapidary of the Month winners receive a two-speed Dremel Model 200 N/40 MultiPro kit and a wall plaque in recognition of their creativity and craftsmanship. Winning projects are also posted on our Web site, www.rockngem.com.

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SHOW DATES

Mark Your Calendar!

Submit show date information at least four months in advance using the electronic form at www.rockngem.com.

April 2015

3-5—EUGENE, OREGON: Wholesale and retail show; Gem Faire Inc, Lane County Events Center; 796 W 13th Ave; Fri. Noon-6pm, Sat. 10am-6pm, Sun. 10am-5pm; Admission = \$7, Children Free (ages 0-11); Fine jewelry, precious & semi-precious gemstones, millions of beads, crystals, gold & silver, pearls, minerals & much more at manufacturer's prices. Exhibitors from around the world. Jewelry repair & cleaning while you shop. Free hourly door prizes.; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: <http://www.gemfaire.com>

4-5—CHICO, CALIFORNIA: Show and sale; Paradise Gem & Mineral Club, Silver Dollar Fair Grounds; 2335 Fair St.; Sat. 10-5, Sun. 10-4; adults \$3, children (under 16) free; "Petrified Wood": 48 display cases, free specimens for the first 200 children; contact Manuel Garcia, 5659 Foster Rd., Paradise, CA 95969, (530) 877-7324; e-mail: mmpg@att.net

4-5—POCATELLO, IDAHO: Annual show; South East Idaho Gem and Mineral Society (SEIGMS), Bannock County Fairgrounds; 10588 Fairground Drive; Sat. 10 am-6 pm, Sun. 10 am-5 pm; Adults \$2.00, Children 12 and under free with adult; contact Larry Manhart, (208) 406-3990; e-mail: Luv2huntrocks@gmail.com

4-5—LINCOLN, NEBRASKA: Annual show; Lincoln Gem and Minerals Club, Inc., Lancaster Event Center; 84th and Havelock Ave, Lincoln Room; Sat. 9:00 AM-6:00 PM, Sun. 10:00 AM-5:00 PM; Admission = \$5.00, Children 11 and under free with adult; Adult 2 day PASS \$9.00. Dealer Space FULL. Educational Programs daily. Gem Digs Discover the Beauty of Rock.; contact James Marburger, 334 Locust, Box 64, Hickman, NE 68372, (402) 430-6703; e-mail: jm24122@windstream.net; Web site: www.lincolngemmineralclub.org

9-11—WYOMING, MICHIGAN: Annual show; Indian Mounds Rock & Mineral Club, Rogers Plaza Town Center; 972 28th St. SW; Thu. 9:30-9, Fri. 9:30-9, Sat. 9:30-7; free admission; dealers, minerals, fossils, gems, jewelry, beads, rough, equipment, books, displays, demonstrations, children's table; contact Don Van Dyke, 4296 Oakview, Wyoming, MI 49519, (616) 669-6932; e-mail: donvandyke@tm.net; Web site: www.indianmoundsrockclub.com

10-12—ORLANDO, FLORIDA: Annual Spring Gem, Mineral and Bead Show; Central Florida Mineral & Gem Society, National Guard Armory; 2809 S. Fern Creek Ave.; Fri. 1-6, Sat. 10-6, Sun. 10-5; adults \$5 (\$1 off coupon on Web site), students \$2, Scouts free; demonstrations, cabochon cutting, faceting, wire wrapping, flint knapping, metal work, 30-minute auctions, kids' table, sluice mining for gems, hourly door prizes, gems, minerals, beads, metaphysical stones, fossils, Scout merit badges; contact Paul Hayes, 1400 Sawyerwood Ave., Orlando, FL 32809, (407) 816-1229; e-mail: phayes3@cfl.rr.com; Web site: www.cfmg.org

10-12—HILLSBORO, OREGON: Wholesale and retail show; Gem Faire Inc, Washington County Fairgrounds; 873 NE 34th Ave; Fri. Noon-6pm, Sat. 10am-6pm, Sun. 10am-5pm; Admission \$7, Children Free (ages 0-11); Fine jewelry, precious & semi-precious gemstones, millions of beads, crystals, gold & silver, pearls, minerals & much more at manufacturer's prices. Exhibitors from around the world. Jewelry repair & cleaning while you shop. Free hourly door prizes.; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: <http://www.gemfaire.com>

10-12—ABBOTSFORD, BRITISH COLUMBIA, CANADA: Annual show; British Columbia Lapidary Society, Ag. Rec. Center; 32470 Haida Dr., Canada; Fri. 10 am-8 pm, Sat. 10 am-6 pm, Sun. 10 am-6 pm; Admission \$ 6, Students \$ 2, Children under 6 free; club displays, demos, 25,000 sq. ft., new tailgate sale; contact Cam Bacon, (604) 854-1711; e-mail: showchaircam@yahoo.com

10-12—VISTA, CALIFORNIA: Annual show; Vista Gem and Mineral, Antique Gas and Steam Engine Museum; 2040 N. Santa Fe Ave.; Fri. 10 am.-5 pm, Sat. 10 am-5 pm, Sun. 10 am -5 pm; Admission is Free; Free Parking and admission to museum during show; contact Ray Pearce, (760) 535-5524; e-mail: ray-srocks@cox.net

10-12—EDISON, NEW JERSEY: Annual show; Eons Expos, LLLP, NJ Convention & Expo Center; 97 Sunfield Avenue; Fri. 12 pm-p pm; Admission \$10.00, Students \$5.00, Children Free; Mindat.org Lecture Series, huge UV Mineral Exhibit in the Junior Ballroom, Viewing Stone exhibit, sluicing for the kids, regional club displays, demonstrations, and more activities & exhibits added closer to show

continued on page 50

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Story by Bob Jones

The Munich Show

Europe's Great Annual
Mineral, Fossil and Gem Event

Each year, on the last full weekend of October and immediately following Oktoberfest in Munich, Johann and Christof Keilmann host the largest gem and mineral show held in Europe. Known as Mineralientage München, this annual event is housed in four buildings of the Munich Trade Fair Centre at the old Munich airport. This huge show brings together more than 1,000 dealers and about 40,000 collectors from all over the world to participate in this largest European mineral and gem event.



© TMS 2012

Fossilworld hosts amazing exhibits like these reassembled Stegosaurus fossils.



Displays at the 2014 meteorite-themed Munich Show included this fine nickel-iron meteorite with distinctive scalloping.



Some 40,000 people show up to enjoy the Public Fair portion of the show on Saturday and Sunday.

I can't make it over to Germany every year, but I did enjoy the 2014 show, along with a visit to my granddaughter in London. From London, I flew to Munich a couple of days before the Munich Show, where I connected with my son Evan and his Unique Minerals business partner, Mark Mitterman, who were on a buying trip to the Munich Show. We arrived early and had time to do some sightseeing. We were also able to visit the show during its two days of dealer setup. We watched dealers get organized; some of them go well beyond the usual sales booth setup and construct an actual mineral sales shop or a finely decorated jewelry store.

On our first free day, we went into downtown Munich to the famous Marienplatz, where crowds assemble on the hour to observe the striking of the famous clock of Munich. On the hour, the Rathaus Glockenspiel chimes and mechanical figures revolve around a stage, dancing and acting out historical events. Equally entertaining were actors who act as living statues or dress as someone famous like Charlie Chaplin and work the crowd for donations.

The second day of our free time, we returned to the Marienplatz, but this time we spent hours at the nearby Munich Residence Museum Treasury, a couple of blocks from the Trade Fair Centre.

This amazing museum is the political and cultural center of the first Dukes of Bavaria. The museum room that is most amazing is the Königsbau, or King's Tract. The royal jewels and treasures of the Bavarian royalty, dating as far back as the Middle Ages, are on display here. This includes the objets d'art and jewels of kings of Bavaria over the centuries, right up to King Ludwig and Queen Theresa in the 20th century.

This Imperial Complex contains some 90 rooms, each one an amazing sight. In the Königsbau, we spent a couple of hours in awe over exhibits of crowns, jeweled necklaces, amazing jeweled pins and brooches, rings, and kingly implements, all treasures denoting the official office of the king.



The Arkenstone, of Texas, displayed lovely groups of recently found violet fluorite specimens from China alongside wulfenite crystal clusters.

Among the pieces I particularly enjoyed was a carved St. George the Dragon Killer mounted on an ivory horse. Every part and piece of this spectacular exhibit was encrusted with jewels, including an emerald-encrusted, dead dragon at the feet of St. George's horse! The royal crowns and regalia were heavily encrusted, mainly with cabochon-style gems. All in all, this royal display rivals other such displays I've seen in Russia, England, and stately homes in the United States.

As stunningly beautiful as the Royal Regalia is, what excited me most was the Crystal Room. This room houses myriad exquisite crystal carvings of animals, vases, goblets and more. These objets d'art were all carved of natural quartz crystals, with delicate designs carefully etched and engraved into the outer surfaces of the subjects. To accomplish such delicate work, the artists had to overcome the obvious problem of quartz's natural cleavage—a remarkable feat.

Against such a setting, Evan, Mark and I went to the show during setup days. The show differs markedly from most regular gem and mineral shows. Dealers are given two days to set up, which gives them time to construct a mineral salesroom or jewelry store setting. The four show buildings have a total of 500,000 square feet of floor space! Each building has a name—Mineralworld, Stoneworld, Gemworld and Fossilworld—that clearly indicates what you can expect to find there.

Within each building there are designated areas set aside for specific reasons. In Mineralworld, there is the Mineral Pavilion, where the leading dealers in the business are clustered. In the Overseas area, non-European dealers are clustered. There is an Alpine area for dealers who specialize in the minerals of that area. It is here where you can meet and buy from "strahlers" who have actually self-collected the treasures of the Alps. Gemworld houses some 330 dealers from 30 countries, and features an

area for showcasing new designs. Together, these “worlds” make the Munich Show one amazing event.

I must confess that I spent nearly all my time in the mineral and stone buildings. I spent the two setup days just checking in with all the dealers and asking about what was new or unusual. I had a special purpose aside from personal interest. It gave me a chance to visit with dealers I might interview, while ferreting out subject minerals we might shoot for the annual “What’s Hot in Munich” DVD. BlueCap Productions, owned by Bryan Swoboda, puts together DVDs for this and other major shows, like the Tucson Show.

I am just one host who works on these amazing programs. In Munich, Bryan and I were joined by Peter Lyckberg, a delightful fellow and world traveler who really knows his minerals. Peter did the on-camera hosting at Munich in 2013, when I couldn’t make the show.

The Munich Show is a three-day event, but those days are divided. Friday is Dealer’s Day, when mineral and gem dealers can search for dealer stock, make trades and purchases, and otherwise conduct business. Saturday and Sunday are the Mineral Borse, or Public Fair, when some 40,000 people show up to enjoy the show, find treasures they can buy, and otherwise socialize. This is when youngsters get a chance to experience the fun of collecting. In Fossilworld, they can take hammer and chisel in hand and split sedimentary rock to expose small fossils, which they get to keep. In Gemworld Pavilion, there is a huge, sand-filled area where kids can dig for crystal treasures they can also keep.

Every year, the Munich Show has a theme. In 2014, the theme was Meteorites. We all know meteorites are made of minerals and elements. Some are pure nickel-iron like the ore of the earth, while others are mixtures of minerals like the earth’s mantle. But meteorites are far more than inanimate objects from outer space. They have played a major role in human history, a story superbly told by Professor Dr. Bernhard Graf, whom we interviewed for “What’s Hot in Munich”. It was Dr. Graf who did the research for the Meteorite exhibit, which tells the stories of the great impact meteorites have had on human life and history.

A superb example of this is Halley’s Comet, one of the most famous celestial sights that are visible from Earth. It returns to the heavens over our planet every 76 years, but the most famous sighting happened in 1066 CE. At that time, there was a great disagreement between Norman and English royalty as to who was the rightful kind of England. This led to an invasion of England by the Normans, and a pitched battle known as the Battle of Hastings oc-



Evan Jones surveys a typical messy situation created as a dealer unpacks during setup day.



“Fossil Dissection” is one of many hands-on activities for children and teens.

curred. Coincidentally, Haley’s Comet appeared in the heavens. The Normans took this as a good omen, while the English foresaw the death of their king. During the battle, on Oct. 14, 1066, the English king was killed and the Norman leader, William the Conqueror, claimed the English crown. This entire event was memorialized in the now-famous Bayeux tapestry, an amazing hanging that measures well over 68 meters long. In that tapestry, the comet is woven into the skies above the battle scene.

One meteorite that caught my eye in the Munich Show fell in Germany in 1492, a date that is quite important to the Western

Hemisphere’s re-discovery by Columbus. This meteorite fell in a field on Nov. 7, 1492, and was actually observed by a boy as it fell. This is the first confirmed recorded sighting of a meteor fall in Europe.

Of course, the entire world knows of the meteorite impact at Oblast Chelyabinsk, in the Southern Urals of Russia, on Feb. 15, 2013, which happened to be during the Tucson Show. This meteorite actually caused quite a lot of damage when it exploded in the atmosphere above Chelbarkul Lake, near Chelyabinsk. Windows were shattered, locals panicked, and news people from all over the world descended



In the Alpine section of the Munich Show, you can always find choice hematite roses from the Swiss Alps.



This remarkable anhydrite "flower" was recovered from one of the great amethyst deposits at Rio Grande do Sul, Brazil.

on this remote Russian town. The Munich Show organizers publish a themebook for each show. An article about the Chelyabinsk meteor strike with photographs is just one meteorite report found in the wonderful hard bound book for 2014. You can order it at www.munichshow.com.

It is amazing what an impact some meteorites have had on religion. Have you ever wondered why the people of the Islamic world make a pilgrimage to Mecca each year? It is the site of the Kaaba, the sacred building in the Grand Mosque toward which Muslims pray, and the location of "the Black Stone", or "the Black Stone from the Garden of Paradise". The Black Stone is believed to have been a meteorite of great age that was set into the wall of the Kaaba by the prophet Mohammad in the 7th century. Each year, pilgrims come to celebrate their religion and touch and kiss the stone, which was also held and kissed by Mohammad.

Meteorites have also been important to the Christian faith. A series of popes, beginning with Pope Gregory XIII (1572-85) and including Pope Leo XIII (1878-1903), began to support scientific research in astronomy, including meteorites, a move that was partly triggered by meteorite events. Detailed information on the Vatican's involvement can be found in the 2014 themebook.

The Munich Show offers the visitor a great opportunity to see minerals that do not reach America. One Greek dealer doing his first Munich Show had some very nice Greek minerals, including fine things from the classic Lavrion silver mine. A small cuproadamite was particularly attractive to me.

The Arkenstone, from Texas, had a nice display of new, purple fluorite from China, a country that provides something new for

just about every show. Another dealer had some freshly mined cassiterites and specimens of ferberite from Bolivia. The cassiterite crystals were small, but very bright and attractive. One of the dealers I've known for decades, Wayne Leicht of Kristalle, displayed some of the delightful crystallized gold for which he is world famous.

At many mineral shows these days, you see fine examples of the bright-violet amethyst specimens from Rio Grande do Sul, Brazil. Several dealers in Munich had exceptionally showy decorator pieces of curving amethyst with quite showy calcite crystals, many of them in odd forms.



Lovely cadmium-rich smithsonite from Sardinia is one of the old classic European specimens I found at the Munich Show.

Currently, there seems to be a steady release of personally owned collections that is taking advantage of the high prices today's collectors will pay. This brings classic species mined decades or even centuries ago into the marketplace. One dealer had a delightfully delicate herringbone silver specimen from the mine at Batopilas (Copper Canyon), Mexico. Another dealer, Crystal Classics, also had fine specimens from an old Australian collection. The owner had spent years gathering excellent examples of minerals from Broken Hill, New South Wales. The display contained fine smithsonite, several rare species, and excellent, deep-red rhodonite crystals embedded in galena.

All in all, the 2014 Munich Show lived up to its reputation again. It is the best and largest mineral show in Europe. With well over 1,000 dealers offering countless specimens, any visitor is hard pressed to see everything and overcome the temptation to spend and spend. The end result is you come away with a sense of accomplishment if you see it all and find something special for your collection.

One thing to watch for next year is a wonderfully crafted book that will be released by its artist/author, Eberhard Equit. Eberhard is an accomplished artist who creates remarkable drawings of minerals. I have a copy of his 2003 book, which has some of the most breathtaking drawings of minerals I've seen. The new book will be introduced at Munich in 2015. Eberhard's new work is entitled *Tourmaline und Andere Minerale* (Tourmaline and Other Minerals), and the text is in both German and English. I've seen some of the completed drawings, which we filmed for "What's Hot in Munich".

The book will be an instant classic, thanks to Eberhard's skilled artistry. ♦

Large Cabs: Grinding the Dome

The girdle line determines the height of the girdle in the finished cabochon. To draw the line, place the cab preform flat on the work surface and lay a ballpoint pen or aluminum pen on the surface pointing at the girdle. Place various spacers—usually templates—under either the preform or pen until the pen is pointing directly at the middle of the girdle. How high you want to make the mark is a personal choice determined by the thickness of the preform, how high you want the dome, or how you choose to design the girdle shape.

Traditionally, I have shaped the girdle as a flat edge up to the halfway point, then contoured a low slope away from that edge to form the dome of the cab. Later in the process, I will taper this flat girdle edge slightly inward toward the center of the cab to allow the bezel material to be pressed inward when I set the cab in a metal finding. My very large cabs won't be set in any type of setting due to their size, but I still make the girdle in this shape out of habit.

Ensure that the girdle line is clear, thin, and well defined. This reference line determines the overall shape of the cab. This particular slab is rather thin at $\frac{3}{32}$ inch (4.1 mm), so to get a higher dome that will reach all the way across the preform, I lowered the grind line so that the girdle height will be .077 inch (1.97 mm) and the material for the dome will be .085 inch (2.16 mm).

The preform is now ready for the first shaping grind. Hold the preform in both hands and tilt the top edge against the

wheel. You will be grinding the first pass down to the girdle mark and into the front of the cab about $\frac{3}{8}$ inch. Again, grind down to the mark but *never* beyond it. I continue grinding at this angle all the way around the preform, stopping frequently to ensure that I am keeping the grind width at $\frac{3}{8}$ inch. Correct any deviations from this as they arise.

On the next grinding pass, tilt the bottom of the preform farther under the wheel and extend the width of the grind to $\frac{1}{2}$ inch. Turn the preform over and hold the dome side against the wheel, touching it to the wheel nearer to the center of the cab, and rotate it upward and toward you as you grind. You are trying to remove material all the way down to the edge of the preform. Continue grinding this way all the way around.

Next, hold the cab against the wheel starting closer to the center of the cab and grind all the way around. Repeat this motion until you have reached the center of the cab. Never grind flat across the center of the cab because this will just add to having a flat top.

This next step is a significant deviation from the usual cabling steps because I sand dry across the top with a worn 60 grit belt.

Always wear proper breathing safety devices when working dry and go slowly so you won't have a heat buildup that could damage the cab. This step goes quickly and reveals spots in which significant sanding is required to get the grinding marks out and remove the flat spots. ♦

The next step will be to sand the dome of the cab, using both wet and dry techniques.



Grind the first pass down to the girdle mark and into the front of the cab.



On the second grinding step, remove material all the way down to the edge of the preform.



The final grinding step is to sand dry across the top with a worn 60 grit belt.



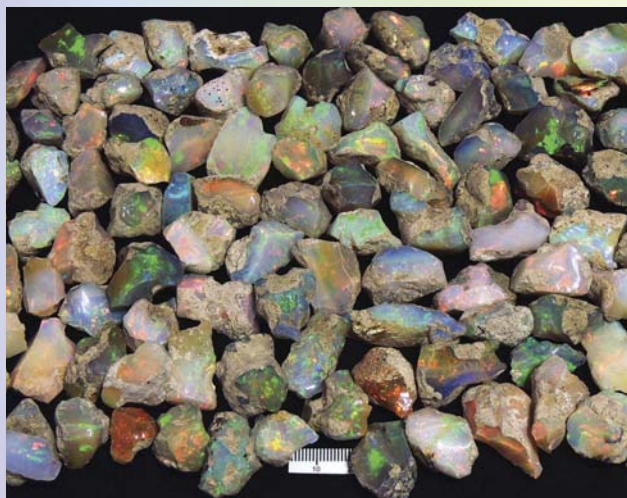
The girdle line determines the height of the girdle in the finished cabochon.

Bob Rush has worked in lapidary since 1958 and metal work and jewelry since 1972. He teaches at clubs and at Camp Paradise. Contact him at rocksbob@sbcglobal.net.



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The Rocks and Minerals of the **MAYA**



Jade, Gold, Turquoise and Obsidian Were Well Known

Story and Photos by Steve Voynick

A decade ago, I met archaeologist Mary Lou Ridinger and her husband, Jay, the couple who rediscovered an ancient Maya jade source in Guatemala in the 1970s, then established that nation's first jade-mining and jade-cutting business, an enterprise that continues to employ many individuals of Maya ancestry today. Intrigued by the beautiful Maya ceremonial masks that the Ridingers had replicated in Guatemalan jade, I had ever since associated the Maya civilization primarily with that gemstone.

Stelae ("banner stones") are tall, elaborately carved, bas-relief stone pillars that commemorate royal births and marriages, visits of dignitaries, and military victories



Recovered from a Maya tomb, this 8-inch “eccentric” was flaked from chert as a ritualistic offering at the time of burial.

But during a recent visit to “Maya: Hidden Worlds Revealed”, a traveling museum exhibition at the Denver Museum of Nature & Science, I learned that jade was only one of many rocks, minerals and gemstones utilized by the Maya. Along with the exhibition’s extensive collection of jade were many other artifacts of gold, turquoise, cinabar, obsidian, chert, limestone, volcanic tuff, rock crystal, and pyrite, as well as beautiful ceramics and colorful murals that the Maya created using mineral-based paints and glazes.

The Maya civilization, a loose collection of city-states with similar customs and languages, existed for three millennia in Mesoamerica, a region that encompasses present-day Belize, Guatemala, the Chiapas and Yucatán regions of Mexico, and the western parts of Honduras and El Salvador. Archaeologists divide the Maya civilization into three major periods based on societal and technological levels of development: the Preclassic, from 1500 BCE to 250 CE; the Classic, from 250 CE to 900 CE; and the Postclassic, from 900 CE to 1500 CE.

While Europe was still mired in the Dark Ages, the Maya had already charted the heavens, developed the first writing system in the Americas, compiled a sophisticated calendar, acquired an understanding of mathematics, built massive and imposing stone monuments, and created beautiful ceramics and elaborate jewelry. Most of these achievements involved the utilization of an array of rocks and minerals.

The most precious material in the Maya world was jade. The term “jade” refers to the gemstone forms of two different min-



This 8-inch mosaic mask of jadeite, from the late Classic Period, was worn on a ruler’s belt. The teeth and eyeballs are made from conch shell.

erals: nephrite and jadeite. Nephrite is the gemstone form of tremolite-actinolite, a basic calcium magnesium iron silicate that is a member of the amphibole group of inosilicates.

Jadeite, the type of jade used by the Maya, is a sodium aluminum iron silicate and a member of the pyroxene group of inosilicates. Jadeite gemstones are a mix of at least 90% jadeite and a lesser amount of the feldspar-group mineral albite. Harder,

more translucent, and more intensely colored than nephrite, jadeite is rarer and considerably more valuable.

When nearly pure, jadeite is white, but traces of accessory elements create a range of colors, which often—but not always—are some shade of green. Because of its interlocked, microcrystalline structure, jadeite is extraordinarily tough and resistant to chipping and breaking, making it an ideal material to make into knives and other tools.



ABOVE: Decorated with powdered cinnabar, this 3-inch-tall jadeite figurine was made as a burial offering during the early Classic Period.

TOP RIGHT: These mask ornaments of hammered gold from the Postclassic Period were probably obtained by the Maya in trade.

RIGHT: These 5-inch, flaked obsidian knives, larger than would be needed for everyday use, were made as burial offerings.



With its pleasing colors, soft translucency, and ability to take a high polish, jadeite also has much aesthetic appeal. Jadeite was sacred to the Olmec, Mesoamerica's first advanced society and the predecessors of the Maya. The Olmec used jadeite to make beads, pendants, celts (ax heads), representations of deities, and remarkably realistic human masks. The Olmec passed on to the Maya their reverence for jadeite and their basic jadeite-working skills.

Jadeite artifacts at the "Maya: Hidden Worlds Revealed" exhibition include beads, earrings, figurines, ceremonial celts, and mosaic masks. All are intricately worked and highly polished—an impressive feat, considering that jadeite is nearly as hard as quartz and Maya stoneworkers could cut it only by repeatedly pulling cords covered with fine silica paste across it. They then polished the jadeite by hand rubbing it with an even finer quartz paste.

Jadeite, the Maya symbol of water and sprouting plants—and thus of fertility, life and rebirth—was primarily obtained from the Motagua River Valley in southern Guatemala. Both rough and worked forms of jadeite were major trading commodities and have been recovered from cultural sites in places as distant as Co-

lombia and the eastern Caribbean island of Antigua.

Archaeologists are using geochemistry to determine whether the Motagua River Valley was the sole source of Maya jadeite. Because trace elements in jadeite are source specific, researchers hope to find the answer with a technique called neutron-activation analysis, in which jadeite artifacts are bombarded by neutrons. Analysis of the resultant radioactivity emitted by the irradiated jadeite can then identify isotopes of source-specific elements. Results to date indicate that not all Maya jadeite came from the Motagua River Valley, and therefore that other Mesoamerican jadeite sources await rediscovery.

Among the many common materials used by the Maya was limestone, which forms the bedrock of much of Mesoamerica. Limestone is a sedimentary rock that contains at least 50% calcite (calcium carbonate). The great, stepped temples and pyramids that are the hallmarks of Maya architecture were built of hand-hewn limestone blocks joined by a lime-based mortar; the blocks were originally covered by an exterior coating of white stucco.

At Mohs 3-4, limestone is soft and easily shaped with harder stone tools. Maya

stonemasons quarried blocks of limestone, then shaped and smoothed them with hammers, chisels, and other tools made of basalt (Mohs 5.5-6.0) and chert (Mohs 6.5-7).

The Maya also used limestone to manufacture mortar and stucco, starting the process by roasting (calcining) limestone in fires. As heat converted the contained calcite into lime (calcium oxide), the limestone deteriorated. The powdered lime was then concentrated and mixed with water to create a slaked-lime (calcium hydroxide) mortar that, when applied to limestone blocks, recrystallized as calcium carbonate in the form of a durable, concrete-like material. The Maya used highly refined lime to make stucco, a fine-grained, white plaster suitable both for exterior architectural use and as a substrate for paintings.

Making mortar and stucco required enormous quantities of wood. Given the inefficiency of calcining limestone in low-temperature wood fires, archaeologists estimate that making the mortar or stucco needed to cover an area of just 1 square meter required the wood of 20 trees. Some archaeologists suggest that mortar production contributed substantially to the deforestation that may have ultimately helped bring about the decline of the Maya civilization.

Limestone also served as a sculpting medium for statues and stelae. Stelae ("banner stones") are tall, elaborately carved, bas-relief stone pillars that commemorate important events in the lives of royalty, recording such events as royal births and marriages, along with visits of dignitaries and military victories. The written Maya language consists of more than 800 hieroglyphs, which were carved into stelae.

Another stone used for statuary and stelae was tuff, a compacted mix of volcanic ash and small rock fragments that lithified into a soft, fine-grained, easily worked rock.

The Maya are also known for their pottery, which consists primarily of clay obtained from riverbeds mixed with ground calcite, quartz, or volcanic ash that was fired in ovens. Maya polychrome pottery has four basic colors: off-white, reddish-orange, brownish-yellow, and black. The off-white is the color of the clay itself. The other three colors were produced by glazes containing the only three common, mineral pigments that could survive the firing process. The reddish-orange came from a glaze of hematite, or iron oxide, while the brownish-yellow is from limonite, an indeterminate mix of iron oxides and hydroxides, mainly goethite, or basic iron oxide. The black color comes from a glaze of pyrolusite, or manganese oxide.

The blue color on some Maya pottery is not a glaze, but a paint that was applied

after firing. The paint's blue pigment, called "Maya blue," is historically significant as the first permanent, synthetic blue pigment. Maya blue is a mix of organic and mineral materials. The blue color comes from indigo, a dye derived from the leaves of common *Indigofera*-genus plants. The mineral component is the phyllosilicate clay mineral palygorskite, a basic hydrous magnesium aluminum silicate. Palygorskite forms fibrous microcrystals with an unusual affinity for organic molecules, to which they attach by hydrogen bonding.

When a water mix of indigo and palygorskite-based clay is boiled, the indigo turns from black to blue, while the indigo and palygorskite molecules bond together to chemically stabilize the blue color. In Maya artifacts, pure, organic indigo would have decomposed completely. But synthetic Maya blue has endured, largely in its original color, even after thousands of years of burial in tropical heat and humidity. Maya blue pigments are still made commercially today.

Another interesting Maya pigment was made from the uncommon mineral cinnabar, or mercury sulfide, obtained from the highly mineralized area near present-day Santa Bárbara, Honduras, which has been mined in modern times for a number of metals, including mercury. Powdered cinnabar is a bright-red pigment that was sacred to the Maya, who used it sparingly to

accent the green color of certain jade carvings, and as a pigment in paint for ceremonial pottery. Its primary use, however, was in burial rituals. Excavations of royal tombs have uncovered skeletal remains of Maya rulers colored a bright red from powdered cinnabar that had been applied to their bodies before burial.

Interestingly, archaeologists have also recovered a number of ceramic containers filled with small quantities of metallic mercury. Some archaeologists suggest that the silvery, highly reflective liquid metal fascinated the Maya and may explain their reverence for cinnabar.

The source of this mercury remains uncertain, however. Some researchers believe it was collected in its elemental state, while others think it was obtained by roasting cinnabar in a simple, low-temperature process that reduced mercury sulfide to metallic mercury by driving off the sulfur as sulfur dioxide gas.

The most spectacular Maya use of mineral-based pigments was in large, colorful murals. While Maya murals were found in archaeological excavations in the late 1800s, most had been nearly destroyed by the tropical heat and humidity and by chemical and biochemical alteration. Then in 1946, local residents led archaeologists a group of remarkably well-preserved, 10-foot-tall murals within a buried, three-room stone structure at a site called Bonampak, in Chi-



This 8-inch, Classic Period plate shows the three basic pigment colors of fired, polychrome Maya pottery: the reddish-orange of hematite, the brownish-yellow of limonite, and the black of pyrolusite.



Rather than serving as a tool, this 5-inch, transparent, rock-crystal knife from the Classic Period was used to communicate with the spirit world.



These 2-inch, gold-turquoise earrings, recovered from a Maya site, were probably acquired by trade during the Postclassic Period.

apas, Mexico. The preservation of these wall paintings was due to calcite-laden rainwater that had dripped through the stucco ceiling. As the rainwater seeped down over the murals, it precipitated a thin, transparent layer of colorless calcite that protected both the paint and the stucco substrate.

Created with paints containing hematite, limonite, pyrolusite, and Maya blue pigments, the Bonampak murals are a kaleidoscope of saturated blacks and vivid reds, oranges, yellows and blues. Painted in 791 CE, these murals record an actual event, in which a king presented his infant son as his successor.

The scenes of war, pageantry, bloodletting, and human sacrifice led scholars to revise traditional ideas of Maya lifestyles. As the best-preserved visual record of the Maya as they saw themselves, the Bonampak murals show that bright costumes, extravagant personal ornamentation, music and dancing played significant roles in Maya life—at least in some levels of society.

In the 1980s, the Bonampak murals were cleaned to allow close examination with state-of-the-art technology. Since that time, infrared photography has revealed many previously hidden details of color and form, while X-ray-fluorescence and spectroscopic techniques have defined the chemistry of both the paints and pigments. This enabled the paints to be physically recreated using the same natural pigments. These colors were then digitally added to computerized images of the murals to create enhanced reproductions, which are a major attraction at the “Maya: Hidden Worlds Revealed” exhibition. The colors of these life-size reproductions are not guesswork, but triumphs of scientific reconstruction that present the same colors that the Maya artists saw when they originally painted the murals.

The few gold artifacts that have been recovered from Maya ruins are an anthropological puzzle. Despite their high levels of technological development in many areas,

the Maya lagged far behind contemporary regional cultures in metallurgy. Even before the Maya Classic Period, cultures in present-day Costa Rica, Panama and Colombia had developed remarkably advanced gold-working techniques. Yet, gold didn’t appear in Maya culture until around 800 CE, near the end of the Classic Period.

Although the Maya had no gold mines, they did have access to gold through trade and could have acquired large quantities of the metal in exchange for jadeite, which was in high demand by the gold-rich cultures in Costa Rica. Some archaeologists suggest that the Maya focus on jadeite was so great as to preclude any interest in, or need for, gold.

The Maya of the Postclassic Period may have fashioned some raw gold into earrings and mask ornaments, but acquired most of their gold artifacts in finished form through trade. The Chichén Itzá cenote, a large, water-filled limestone sinkhole in the Yucatán, has yielded the most gold artifacts. It was a sacred site into which the Maya cast golden objects as ritualistic offerings.

Turquoise also did not arrive in the Maya world until the Postclassic Period. Archaeologists believe that most Maya turquoise came from the Cerillos mines, near present-day Santa Fe, New Mexico, where Ancestral Puebloans had begun large-scale, systematic turquoise mining around 900 CE, a date that slightly precedes the appearance of turquoise in Mesoamerica. The Maya used turquoise mainly as an inlay material in jewelry and mosaics.

The Maya also made great use of chert, a fine-grained, silica-rich, microcrystalline rock that forms when silica replaces calcite in limestone. With its conchoidal fracture and a Mohs hardness approaching that of quartz, chert is an ideal material for tool-making. Chert was so important to the Maya that they established large, specialized workshops near massive chert outcrops in what is now northern Belize.

Along with tools, the Maya also created non-utilitarian forms of chert that archaeologists call “eccentrics”. These are among the most unusual lithic artifacts ever found. Maya chert eccentrics, some over 12 inches long, are delicate and complex objects that represent scorpions, snakes, and stylized human figures. Eccentrics had a ceremonial function and were used as scepter heads by royalty. Because eccentrics are often found in burial sites alongside accumulations of chert flakes, archaeologists believe that making eccentrics was actually a part of burial rituals.

The Maya associated obsidian with their rain gods and considered it to be “fossilized lightning”. An extrusive igneous rock that forms from the very rapid solidification of rhyolitic (silica-rich) lava, obsidian is a natural volcanic glass that consists primarily of silica, with ferromagnesian and feldspar-group minerals. With its pronounced conchoidal fracture, obsidian can be flaked into extraordinarily sharp points and blades.

The Maya worked obsidian, obtained from the volcanic regions of western Guatemala, into both functional and ceremonial objects. Maya obsidian blades are of two types: thin, delicate, flat blades and the stronger “backed” or “prismatic” blades with a triangular cross section. The Maya also fashioned obsidian into figurines, auto-sacrificial (bloodletting) instruments, and eccentrics that served as burial offerings.

Other recoveries from Maya tombs include ceremonial knife blades that have been fashioned from rock crystal, the transparent, colorless variety of macrocrystalline quartz. These blades, as long as 6 inches, were not intended for practical use, but served instead as “windows” into the spirit world and as burial offerings.

The Maya also used highly polished, flat fragments of obsidian and crystalline hematite in mosaic mirrors. Archaeologists believe that their purpose was similar to that of rock-crystal knife blades—to look

into the spirit world and to communicate with ancestors and gods.

One of the most unusual Maya uses of gemstones and minerals was as dental inlays that were symbols of social status. After incisors had been drilled with rope drills, a gemstone or mineral—usually turquoise, jade, hematite, rock crystal, or pyrite—was shaped to precisely fit the hole in the tooth. With no suitable adhesive materials available, the inlay was set in place by pressure, meaning that a perfect fit was critical. At some Maya burial sites, almost a quarter of the skulls have dental inlays.

The long, slow decline of the Maya civilization in the Postclassic Period has yet to be satisfactorily explained, although it may have been due to a combination of factors like drought, harvest failures, warfare, deforestation and overpopulation.

By the time the Spanish appeared in Mexico in 1519, most of the Maya were subsistence farmers in the Yucatán region. Having neither gold nor silver, nor a political center of power vulnerable to attack, the Maya, unlike the Aztecs and Incas, were not destroyed when the Spanish arrived.

About 7 million people of Maya ancestry, who speak some 30 different Maya languages, survive today, most living in Guatemala and the Yucatán. Many still retain their ancient traditions and celebrate ancient festivals. And, at least in Guatemala, it is fitting that some Maya descendants are employed today in mining and cutting the stone that was sacred to their ancestors: jadeite.

"Maya: Hidden Worlds Revealed", which took \$4 million and four years to assemble, affords a great opportunity to see a superb collection of Maya artifacts and reproductions. The exhibition will be at the Boston Museum of Science until May 3, 2015. It will then appear at the San Diego Natural History Museum from June 12, 2015, until Jan. 3, 2016. ♦



This 4-inch-diameter mosaic mirror from the Classic Period is made of polished, flat fragments of crystalline hematite. It was used to access the spirit world.



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ROCK SCIENCE

by Steve Voynick

Colorful, Kaleidoscopic Rocks

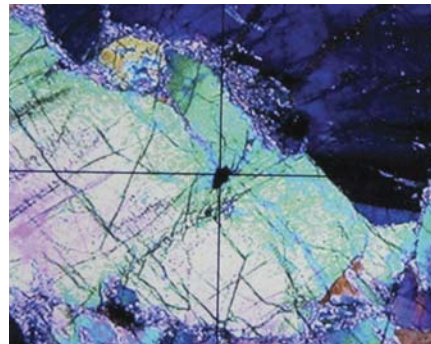
Some of the most fascinating colors and patterns in the world of minerals appear in the images generated when polarized light passes through the crystalline mineral components of razor-thin sections of polished rock. These images, which often appear in mineralogy and petrology textbooks, display surreal, kaleidoscopic patterns and vivid colors that are somewhat reminiscent of abstract art.

Known as thin-section petrographs, these images are the basis of optical petrology. Petrology is the science that deals with the origin, occurrence, structure, composition, classification and history of rocks. The subsistence of optical petrology identifies, describes and quantifies the crystalline mineral components of rocks by analyzing the properties of transmitted, polarized light.

Visible light is a form of electromagnetic energy with vibrations that travel in all directions transversely to the primary direction of propagation. Light becomes polarized when filters restrict these omnidirectional vibrations to a single plane. Like normal light, when polarized light passes through a transparent mineral crystal, it is refracted (bent) and some of its color wavelengths are absorbed. These effects are diagnostic for specific minerals and can thus be used for identification.

Because many mineral crystals are translucent or opaque, optical petrologists must prepare rock specimens in slices or sections so thin that all component crystals become essentially transparent. These aptly named "thin sections" are prepared by cutting slices of rock 3 mm (about 1/8 inch) thick, polishing one side, then mounting each with clear epoxy on a glass microscope slide. The unpolished top of the slice is then carefully ground down to a standard thickness of 0.03 mm—roughly the thickness of a sheet of paper. After a cover glass is cemented atop the prepared thin section, it is studied under a polarizing microscope.

Polarizing microscopes are similar to regular microscopes; the difference is rotatable polarizers, usually Polaroid™ filters, that polarize the light coming from a substage light source. After passing upward through the thin section, this polarized light passes through a second rotatable polarizing filter called an analyzing filter. By precisely orienting the symmetry of individual mineral crystals with the polarization planes, the optical properties of the crystal, and thus certain physical characteristics useful in mineral identification, can be accurately measured.



The subsistence of optical petrology relies on the study of thin-section petrographs.

Refraction is one of the most useful properties that can be measured with thin-section optical analysis. Most mineral crystals are anisotropic; their optical properties, including their angles of refraction, vary when measured in different directions. The exceptions are isometric or cubic crystals, which are isotropic. Light passing through anisotropic or doubly refractive crystals splits into two rays that propagate at precise, divergent angles that are unique to each mineral species.

Other mineral characteristics that are revealed by thin-section optical analysis are dispersion, pleochroism, cleavage and cleavage angles, and crystal shape. Extinction angle—the angle between a crystallographic axis and the vibration direction of the polarized light—is also mineral-specific. Other properties revealed by thin-section optical analysis are crystal size and shape, which are important clues to the geologic conditions, such as temperature and pressure, under which the rock formed.

Properly aligning the two polarizing filters enables the second filter to recombine doubly-refracted, polarized light rays into a single plane to produce the optical phenomenon of interference and a resulting rainbow of intense, vivid, "electric" hues—each of which is mineral-specific.

While prints of these images have been sold as abstract art, their greatest importance will always be as an analytical tool that provides a glimpse into the heart of crystalline rocks. 💎

Steve Voynick is a science writer, mineral collector, former hardrock miner, and the author of books like *Colorado Rockhounding* and *New Mexico Rockhounding*.





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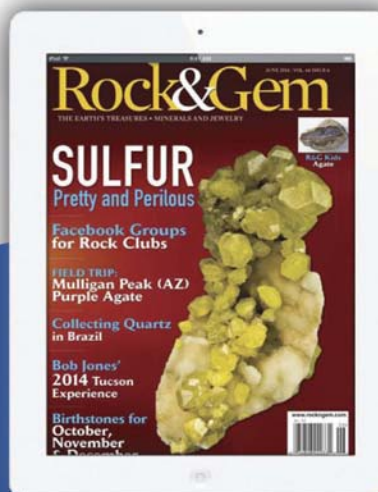
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NEW MEXICO GARNET

The Real “Gold” at Orogrande

Story by Anna Racicot/Photos by Steve and Anna Racicot



Being on hands and knees allows a closer inspection of the country rock, which might seem uninteresting at a cursory glance, but surprised us with a variety of minerals, from garnet to chrysocolla.

A Sunday afternoon trip to the Sandia Mountains east of Albuquerque, New Mexico, when I was a kid was all it took to give me a lifelong love of garnet. I have kept an eye out for garnet ever since. Not long ago, my husband and I took my brother into one of the several Piedra Lumbre (Shiny Rock) areas in the state to show him the veins of tiny garnet crystals there. Naturally then, when my brother saw an article on a garnet mine opening up in southern New Mexico, he gave me a call. Maybe, I thought, just maybe, this new garnet-rich area near Alamogordo, New Mexico, could rival in some way the garnet of the state’s San Pedro mine.



Plans are moving ahead to mine garnet at Orogrande for commercial purposes. Much of the rock there contains 75% to 90% garnet.



The most engaging andradite crystal specimens we found were paired with calcite on a host rock of limestone.

The San Pedro mine has a locale called Garnet Ridge that is primarily composed of varieties of garnet, but these beautiful specimens are generally off limits to the collector. The privately owned San Pedro has a mining history dating from the era of the Spanish conquistadors to modern times. Of course, gold, silver and copper—not garnet—were the materials sought after.

Ranching and mining have always figured large around Alamogordo, 37 miles north of Orogrande. Orogrande is a thin swath of land sandwiched between Fort Bliss and White Sands Missile Range, which are major sources of employment for the locals. Another installation on the outskirts of Alamogordo, Holloman Air Force Base, accounts for 50% of the residents' income. Mining and ranching definitely play second fiddle to the military installations in terms of generating revenue.

The Orogrande district near Alamogordo was also famed, as the name suggests, for gold. Like the San Pedro mine, the garnet of Orogrande had ranked as a poor second next to the precious metals mined there. What drew miners to southern Otero County and started a hundred years of prospecting and mining was the discovery near Orogrande, New Mexico, of a half-inch-size gold nugget in the early 1900s. Whether or not this nugget was "planted" there has been a subject of speculation.

Prospectors first explored the area in 1879, but after the discovery of the gold nugget, mining began in earnest, peaking between 1905 and 1918. The southeastern slope of the Jarilla Mountains (Orogrande's backyard) contained black sand in which placer gold could be found, along with magnetite, ilmenite, hematite and zircon. In the first half of the 20th century, the small

mines in the Jarilla Mountains produced well over 16,000 ounces of gold. From the 1890s until 1925, more than three dozen claims were filed. Some looked for gold or silver, but iron and other metals brought in more wealth. The 1982 paper *Geology and Ore deposits of the Orogrande Mining District*, by Robert M. North, reports that iron brought in about \$500,000 by 1949. By the early 1980s, money from copper topped \$1 million dollars in revenues, followed by gold at \$355,000, silver at \$29,000, and lead at \$12,000.

Putting thoughts of gold, silver, and even turquoise aside, however, our aim was to explore the old mines near Orogrande before the area became more restricted to collectors. A late spring snowstorm hastened our decision to head south toward a lower elevation, warmer temperatures, and of course, more garnet.

DAY ONE

After an overnight stop at Hot Springs (formerly Truth or Consequences, of fossil elephant fame), we made it by midafternoon to the southernmost part of New Mexico. We were rewarded unexpectedly at our first stop, an arroyo near some communication towers just north of what remains of the old mining town of Orogrande. The arroyo, rich in both metamorphic and sedimentary material, revealed chunks of rocks encrusted with garnet crystals: tiny, small and medium, andradite to grossular, red and green.

It was late afternoon by the time we neared the old mining town of Orogrande, leaving us little time for extensive exploration on our first day. The arroyo, an almost surrogate rockhounding site since we had not enough time to travel the old

mining roads, delighted us with plentiful specimens of garnet and some copper minerals. To find this arroyo (GPS coordinates: N 32 24.328', W 106 06.451'), locate the communications towers on the west side of U.S. Highway 54 immediately north of Orogrande, while traveling south to that former boomtown.

Since the sought-after precious metal treasures of a hundred years ago, which we presumed to be largely mined out, were not what attracted us to this remote area, we set our sights immediately on finding garnet, hoping to add some andradite to our collection, which is heavy on the almandine variety from our northern New Mexico area.

We later discovered that these plentiful crystals came from a zone that also contained calcite, and some of the most beautiful specimens we found had both garnet and calcite. Andradite and grossular often occur together in contact metamorphosed limestone and, indeed, this is the case in Orogrande. Andradite and grossular, as well as almandine, the most common member of the garnet group, are iron aluminum silicates.

Grossular and andradite both occur in easy-to-recognize dodecahedral crystals, while andradite also shows a trapezohedral crystalline structure. This hard stone, 6.5 to 7 on the Mohs scale, contrasts sharply with calcite (Mohs 3), both appearing side by side on the limestone host rock.

According to the paper by Robert M. North, there are four contact metamorphic zones formed from the intrusion of monzonite into the limestone stock: a clinozoisite-epidote-calcite zone, an andradite-grossular-calcite zone, a pyroxene zone, and a marble zone.



While garnet was abundant in the arroyo—some as small as the head of a pin and some larger and cruder, approaching a half inch—we began to notice a piece of rock here and there boasting a soft blue-green color, and were able to bag some chrysocolla and malachite before we called it a day.

DAY TWO

The next day, we determined to see what was at the end of the well-maintained gravel road that, at first, followed the arroyo. We drove past dump trucks full of material descending from an unknown location in the Jarrilla Mountain Range. Subsequently, we learned that the trucks emerging from behind a No Trespassing sign were hauling gravel. We also encountered claim signs on the many mines dotting the region. This Orogrande area, which has known claims for over a hundred years, has many active mining claims to this day. The office of the Bureau of Land Management informed me that the BLM encourages claimholders to post their claims, but that there is no requirement to do so.

There are three dangers in this area that rockhounds need to be aware of: (1) rockhounding unintentionally in posted or claim-staked areas; (2) unexpected mine shafts; and of course, (3) rattlesnakes. We carefully avoided the hills and arroyos anywhere near claim markers, even though we were later told by a BLM official that some areas staked as claims may have fallen into arrears on their payments to the state and thus not be under valid claim. New Mexico claim information can be researched at www.geocommunicator.gov.

As far as mine shafts go, rockhounds are warned, almost ad infinitum, to watch out for them, but on this trip, we were particularly reminded of the seriousness of this warning. A sign marking the death of a local teenager by falling into a mine shaft made me extra cautious as we approached those shafts, which welcomed us with cool air on that hot day. These shafts went straight down to unseeable depths. The rattlesnake danger we conveniently avoided by rockhounding in the heat of the day and by watching our steps.

Shut out by gravel pits and staked claims, we returned to the arroyo, where we continued to find garnet with calcite and even some marble—one with small pyrite crystals.

DAY THREE

On day three, we reached the old mining road itself, with mines on either side, going up into the hills. This is where I will begin searching for unusual stones the next time we visit the area, and where we would recommend collectors begin their searches. It is a landscape offering adventure on a couple of different levels. First, there is the



It was easy to understand why copper was mined nearby when we began to see significant pieces of apatite, chrysocolla and malachite.



The richness and the variety of garnet specimens at Orogrande will delight the collector.



The tailing mounds at times compete in size with the small hills along the wash, which runs beside the old mining road.

mine (GPS location: N 32 23.902', W 106 06.424') where my husband found the most beautiful specimen on the trip: drusy quartz on chrysocolla. Another specimen-rich location we determined to be at N 32 24.328' and W 106 06.451'. This canyon is also the area in which we found what we initially took to be a piece of petrified wood, a 5-inch hunk of rock with lines radiating from a central point. A geological report for this area, though, mentions a more probable identification of this stone.

In the pyroxene zone, there are nodules up to 6 inches across that were formerly chert, but have been replaced by needles of wollastonite (a calcium silicate) and diopside. In addition to the intriguing specimens we found there, adventure can also be had by merely driving on that road, which has not seen maintenance, one suspects, for decades.

Old mines with no current claim signs showing appear on both sides of the road in this low canyon. Some mine shafts are grated off, as part of the state's effort to improve safety around abandoned mines.

We found this old mining road by following in part the directions given for Site #116 on page 258 of *Gem Trails of New Mexico*, 9th Revised Edition, by James R.

Mitchell (Gem Guides Book Co., 2010). There were, as far as we could tell, some inaccuracies in Mr. Mitchell's directions. We eventually found this site by driving all the way into the frontier-type town of Orogrande from the direction of Alamogordo. Once in Orogrande, we turned around and headed out of town. The highway curves at the end of town, and at the curve is an old dirt road on the left. We took this road, which immediately splits.

A very old road, not well traveled, heads straight and is the road to the mines. The other and better road parallels the highway before it heads for some low hills. Mr. Mitchell also mentions that this area is part of a bombing range and that one might need to ask permission to collect there. It was our experience in this part of the state that the answer to all questions about entrance onto military land or property was an unequivocal "No". If an area is not marked as government property and fenced off as such, however, it is not.

Orogrande and the mines just north of it are on a thin swath of BLM and private land sandwiched between 1,700 square miles of Fort Bliss to the east and 3,200 square miles of White Sands Missile Range to the west. The mines and the road to

them are definitely not on the missile range, but from them one may experience the sights—high plumes or explosions of dirt—and the sounds—somewhat later and very commanding—of the training exercises at Fort Bliss.

If one were to travel toward Alamogordo and Orogrande from the Las Cruces area, there is also a highway through the White Sands Missile Range from near Las Cruces to Alamogordo that the military only closes for limited periods of time during weapons testing. In addition, there are smaller roads through White Sands, one of which could be a shortcut to Orogrande, but these smaller roads are not open to the public. We learned this by trying to take a shortcut and by having an officer on duty point us back in the direction from which we came.

Although we enjoyed exploring the tailings of several mines on this last day of our stay here, we did not have time to investigate all the piles of tailings we saw. To reach any of these prospects or mines usually involves a hike up a steep hill or traversing the brush-filled arroyo and then hiking up another hill. Traveling from one mine to another does eat up the hours. Also, the road continues farther up the canyon, doubtless leading to more mines, but we were un-



Our finds included (from left to right) two dark pieces of hematite replacing magnetite (martite); marble with tiny pyrite crystals; hematite; and diopside.



Down the hill from a grated-off mine along the old mining road, we came upon a car-size boulder showing a thick band of garnet crystals.

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able to negotiate the increasingly challenging road even with our four-wheel-drive vehicle. A truck with much greater clearance than ours or a four-wheeler would be required to be able to find every pile of tailings in that area.

In January 2014, *The New Mexican*, Santa Fe's newspaper, reported that Daniel Burrell of Burrell Western Resources was prepared to invest \$25,000,000 to mine the commercial-quality garnet in Orogrande. The industrial-grade garnet-rich rocks contain 75% to 90% pure garnet and are found on the surface near a major highway. Burrell hopes to produce three times more than the current U.S. production, and his operation is slated to begin in 2015. Residents of Otero County are no doubt hoping this new "gold" will turn out to be more than a promise and a dream.

WHERE TO STAY

Since Orogrande is a long way from the comforts we may be used to, it would be good to put some thought into where to stay while rockhounding there. Because of the rocky and cactus-filled country, we would not recommend primitive camping near the old mines.

We camped at Oliver Lee Memorial State Park, 30 miles north of Orogrande on U.S. Highway 54. Oliver Lee, for whom the park was named, was a cattle rancher, and he eventually owned the largest ranch in the state. Though famous, Lee was also infamous, being acquitted under odd circumstances for the murder of a man accusing him and others of cattle rustling and destruction of brands.

When we were there, Oliver Lee State Park was not heavily used. It offers RV and tent camping sites, picnic tables, some shelters, showers, and commanding views of the valley. The park is also the entrance to a trail up Dog Canyon (filled with sedimentary rocks) and it is the closest place to stay for those contemplating losing themselves in the numerous collecting sites near the town of Orogrande, which exudes a frontier flavor. Farther north on U.S. Highway 54 is the town of Alamogordo, with dozens of restaurants and some motels.

WHEN TO GO

When temperatures in an area are known to top 100°F on more than rare occasions, it is important to time one's trip there. We visited the site in mid-May—much later than we had hoped—and traveled from snow at 8,000 feet in northern New Mexico to temperatures in the low 90s at this southern edge of the state. The best times to go there are probably April, when the average temperature reaches 79°F in the day and drops to an average of 45°F at night, and October, when daytime temperatures again average 79°F and the nighttime lows are 48°F. The highest

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Our favorite specimen from Orogrande was this piece of chrysocolla covered with drusy quartz on garnet-filled host rock.

temperature recorded there was 112°F in September.

White Sands National Monument, which offers a half-dozen hiking trails in the gypsum dunes, is within 49 miles of Orogrande and worth the stop.

So what do these old Orogrande mines have to offer rockhounds other than garnet and calcite? One list I came upon counted 42 different minerals, from actinolite to zircon. We found chrysocolla, pyrite, azurite, hematite, diopside, and a piece with hematite replacing magnetite. A few miles north of where we were collecting are old turquoise mines, many of which are no doubt still under claim.

There is at least one claimholder who will open his mine to rockhounds for \$40 per person, per day, though I presume his customers are searching for gold, not garnet.

The tools we suggest for those intending to rockhound here unfortunately have to start with a four-wheel-drive vehicle. A rock hammer, a chisel, and a sledgehammer for larger stones would come in handy, though we made do with a 3-pound sledgehammer. Boots, sun hats, and water are also musts.

The Orogrande mines often get on the itinerary for rock and gem clubs in the region, for members are keen to haul away hunks of garnet for landscaping or display or to add something new to their collection—maybe something rare or valuable or maybe something that is just a pleasure to behold. Orogrande mines have the potential to supply it all. ♦

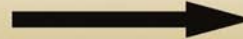
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PROJECT:

Chameleon Jewelry

Versatility Adds to the Beauty of This Setting

Story and Photos by Dave Fisk

Is it a pin? Is it a pendant? Is it a bola tie? It's all three. It is a "chameleon jewelry finding", a piece that can be quickly changed into a brooch, pendant or bola. Crazy Lace agate? Willow Creek jasper? Botswana agate? Did I mention it's also capable of quick disassembly and reassembly with a choice of stones?



I have always been interested in jewelry settings created to allow changing from one stone to another. Having the flexibility to change the entire color and pattern of a piece of jewelry without needing to forge an entirely new finding seems a great way to get a lot more use out of a project. Even better, why not be able to change the use of the piece, as well?

My friend Chuck Di Frenzo showed me a piece of jewelry he had made some time ago. He had come up with a design for a piece that can be used as either a brooch or as a bola slide, with stones that can be changed out in a few seconds. The piece has three basic components. The first is a bezel for holding a stone from the front. The second piece is a baseplate for holding a stone in from the back. The third piece is a hatpin for connecting the two pieces. The hatpin is also used for pinning the brooch to clothing. The bola slide was simply soldered in place on the back of the finding baseplate. This finding gives the wearer the choice to not only change the stone, but the entire function of the piece.

I loved the idea, and spent some time coming up with the idea of one enhancement: I would add a bail to the baseplate of the piece so the jewelry could be worn as a pendant in addition to a pin or bola tie slide.

Once you decide on the basic design, create a rough drawing. Gather the tools and materials you will need before you start.

TOOLS AND MATERIALS

- 30 mm x 40 mm finished cabochons
- 20 gauge sterling wire (1 foot)
- 24 gauge sterling sheet (about ½ inch X ¼ inch)
- 20 gauge sterling silver sheet
- One piece of 5/16-inch-thick hardwood
- Jewelers saw and size 3 blade
- Scissors
- Small hammer
- Knife
- Drill and small bit (#56 or 1/16")
- Files
- Soldering flux
- Pickle pot and pickle
- Torch
- Foam backed-sandpaper, superfine, ultrafine and microfine
- Polishing unit and buff
- Easy-Flo and medium silver solder
- Liver of sulfur
- 2-inch hatpin

INSTRUCTIONS

Fabricate a silver rope to be used as a decoration on the bezel. I did this by cutting a 12-inch piece of 20 gauge sterling wire, bending it at the midpoint, and placing the midpoint in a vise. I placed the two loose ends of the wire into the chuck of a power drill and tightened the chuck. Then I turned the drill on at a slow speed for a very short duration, while keeping the wire taut by pulling it away from the end secured by the vise. This resulted in a twisted double strand of wire resembling a silver rope.

Another way to accomplish this step would be to bend the midpoint around a nail, place the loose ends into a pair of pliers and manually twist the wire into a rope.

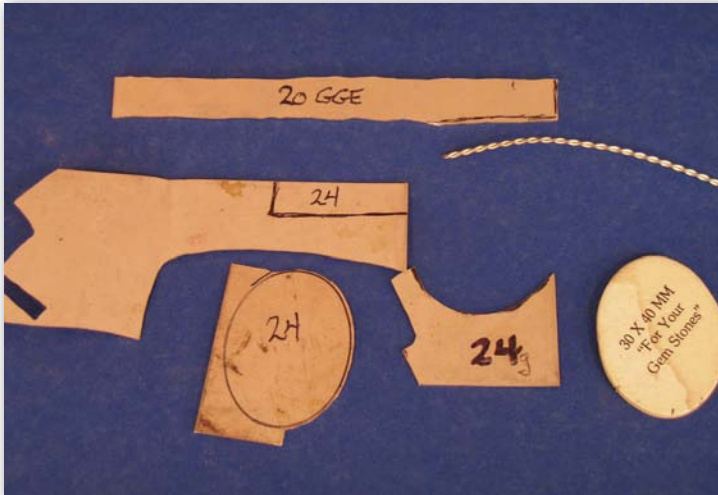
To determine the actual length of silver needed to create the bezel, I cut a piece of paper into a strip 15 mm wide. I formed this strip around a 30 mm X 40 mm template and marked the point at which the end of the strip began to overlap (111 mm). The strip of paper had now become the template for creating the bezel.

Affix your paper pattern to a flat piece of 20 gauge sterling silver and cut out a piece 111 mm long and 15 mm wide using a jeweler's saw and a #3 blade.

With files and sandpaper, smooth the four edges, top and bottom of the bezel. Polish with Tripoli and rouge, then clean the piece thoroughly with soap and water. Place the



Chuck's bola/pin design consists of a bezel, a baseplate and a hatpin. I took it a step farther by adding a bail for a chain.



Use paper patterns to help you cut shapes out of sterling silver sheet.



Create a decorative rope by twisting sterling wire with a vise and drill bit.



Determine the angles for the end of the bezel by wrapping the pattern around a model.

bezel blank and rope decoration on a magnesium block and heat them, then drop them into hot pickle (Sparex™ in a crock pot) to clean them and ready them for soldering and bending.

Rinse the pieces in water to remove the acid and attach the silver rope to the bezel, using cotter pins to hold it firmly. Using medium solder snippets, solder the bezel and rope to the bezel blank along the midpoint of the bezel, then drop the piece in the hot pickle to clean it up for the next step.

After rinsing it with water, bend the bezel into an oval and join it at the ends using Easy-Flo® silver solder snippets and flux. Pickle and rinse again.

To get the bezel into its final shape, create a jig out of a 5/16-inch-thick piece of oak cut into a 30 mm X 40 mm oval using a coping saw. Sand the piece smooth, then file and sand a bevel around the top. Use this bevel as the form to hammer the top of the bezel inward to create the upper boundary for the stone to rest against. While forming, anneal the piece (heat to dull red and quench in the pickle) a few times to make the sterling more malleable.

Once the bezel is formed, re-sand the finding with superfine, ultrafine and microfine sandpaper where necessary, and buff it with Tripoli and rouge. Then heated the piece—not enough to change the metal color—and brush liquid liver of sulfur solution along the rope decoration. (Use plenty of ventilation, as the solution is quite potent.) This immediately turns the area black. Polish the piece on a buff with jeweler's rouge, leaving the nice black patina in the grooves next to the rope decoration. Then wash the piece and your hands.

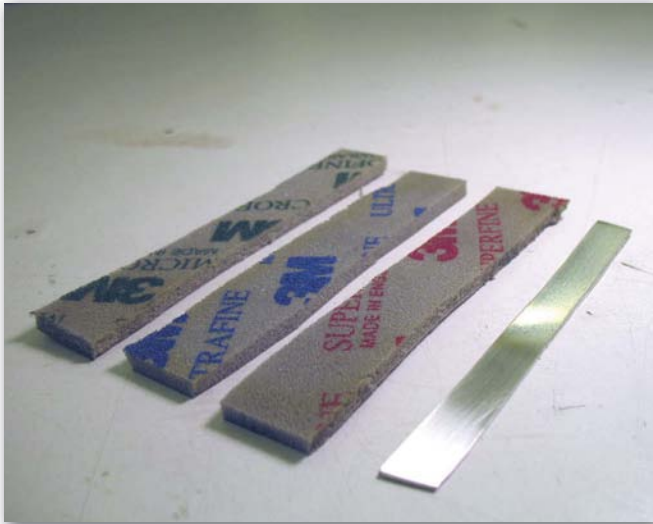
Use a Dremel™ tool in a drill press accessory and a 1/16-inch drill bit to drill holes at the midpoint of the bezel at each of the long axes, close to the bottom edge of the bezel. These holes are used to retain the hatpin, which serves to affix the jewelry to clothing and to secure the stone between the baseplate and bezel.

Make a flat, oval baseplate from a sheet of 24 gauge sterling sheet. Draw a 30 mm x 40 mm oval, a bail, and a bola slide on the sheet, then cut them out using the jeweler's saw and #3 blade. Heat the three pieces and drop them in the pickle pot, then remove and rinse them. Clean the pieces with a file and sandpaper, and buff them with Tripoli and rouge.

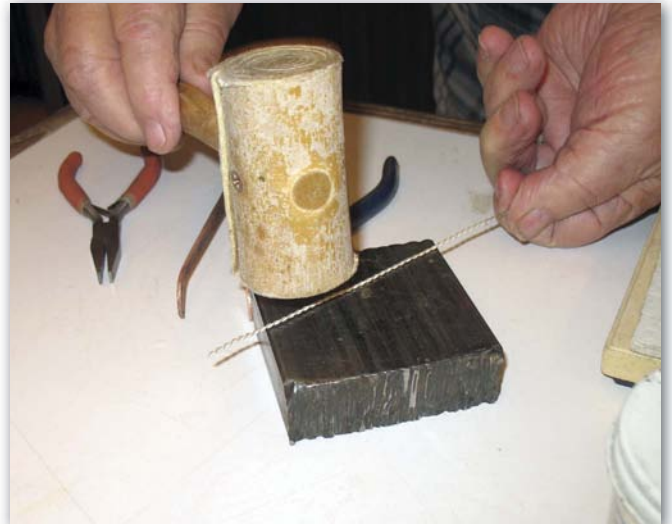
Solder the bail and bola slide into place on the back of the base. I found that I had to place them at the extreme top to allow room for attaching the piece to one's clothing in order to wear it as a brooch. The pendant bail is all the way to the top edge of the bezel (centered 3 mm in), and the bola slide is immediately below it (centered 10 mm in).

After pickling, rinse the piece with water and re-polish the flat side of the plate so that it will reflect light when used with a translucent stone.

I tried this setting with several stones, and voila! we have a chameleon. I am able to use my inventory of 30 mm x 40 mm cabochons as gemstones for this piece. 💎



File and sand the bezel using extra fine, ultrafine and microfine sandpaper.



Flatten the rope decoration with a soft hammer.



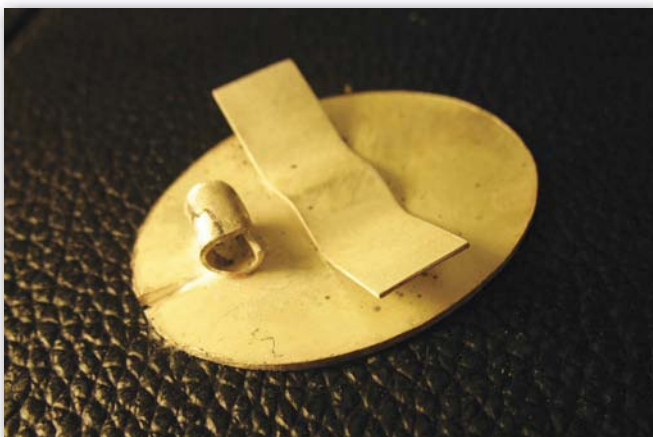
Bend the bezel into an oval and join it at the ends using Easy-Flo® silver solder.



Create a jig from hardwood to facilitate the forming of the bezel sides and top.



To get the bezel into its final shape, hammer the bezel inward over the bevel using light strokes.

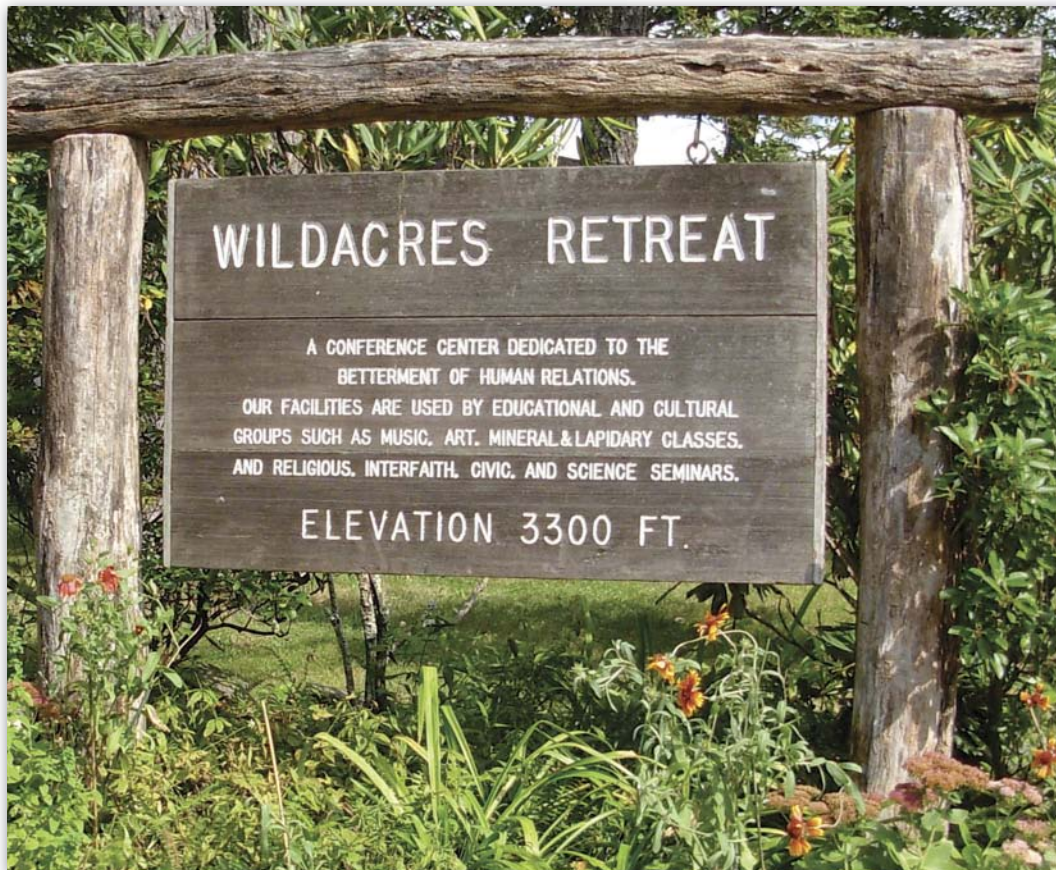


Flux and solder the bola slide fitting and bail to the back of the baseplate immediately below where the bail will be positioned.



Holes drilled in the top and bottom of the bezel allow a hat pin to secure the piece to clothing when worn as a brooch.

WILDACRES



2015

A Very Special Educational Event

Story by Bob Jones

Two of the most important educational events planned by the Eastern Federation of Mineralogical and Lapidary Societies (EFMLS) are held at Wildacres, North Carolina. You won't find "Wildacres" on any state map, as it is a private reserve near Little Switzerland in the Blue Ridge Mountains. Twice each year, the

EFMLS holds classes here. You can learn silversmithing, faceting, lapidary, crystallography, stone carving, beading, and other fascinating rock-related subjects. Classes are held in the morning and afternoon, with the week being split in the middle with a free day. This allows for two days of classes, a day off, and two more days of the same class or a chance to try a different class.



BOB JONES PHOTO

One of the choices students have on the free day is to take an organized field trip to a nearby collecting area.

This year's Wildacres retreat starts May 18 and continues through May 24. You can sign up through your federation, so check with your club's federation representative, who has all the information. You can also contact the Eastern Federation Bulletin Editor, Mary Bateman (mbateman1@verizon.net), who has all the information. Mary is a regular at Wildacres and has enjoyed a variety of classes.

The events are held in the spring and fall. I've never attended the fall event, as it conflicts with my responsibilities at the September Denver Gem and Mineral Show, but I've been invited to the spring event every three years, beginning in the late 1980s. My first stint as a lecturer happened when Ruth Wertz, one of the founders of the Wildacres event, invited me. I prepared nine talks and gave every one of them. In those days, we lectured in the morning and again after lunch. This was later changed to a morning lecture only, and sometimes one evening lecture. Now when I lecture at Wildacres, I do five talks, one each morning before classes start, plus one evening talk. Giving a talk to start off each class day almost guarantees the audience is awake and maybe even alert.

Once I give my morning talk, I'm free to attend classes and visit, observe, and even learn. I was particularly pleased with watching cabochoning teacher Bernie Emery get



BOB JONES PHOTO

One of Editor Bob Jones' talks this year will highlight his collecting trip via helicopter to Arizona's gem amethyst mine, located on Four Peaks at 7,000 feet.



BOB JONES PHOTO

The pegmatite mines of western North Carolina, located near Wildacres, have yielded some amazing gem emeralds.

beginning lapidaries into making cabochons successfully. I ended up doing a cab and writing an article on some of his techniques.

Some years ago, I watched Reivan Zeleznik teach faceting. I was so impressed by his skills that I gave him some faceting rough to cut for me. My wife, Carol, and I had collected it in Mexico. We had been fortunate enough to be invited by Benny and Elva Fenn to visit their gem mine in Chihuahua. The mine was in a volcanic flow shot through with very large phenocrysts of gem labradorite feldspar. The labradorite is a lovely canary yellow, and some of the phenocrysts are 2 inches long and gem clear. In a matter of an hour or so, we had both filled large plastic bags with gem rough suitable for faceting. It was from this "stash" that I gave Reivan maybe a dozen crystal sections with a request that he facet gems for my wife, daughter and granddaughter, and for the Education Fund of the American Federation of Mineralogical Societies (AFMS). He did just that, and the results were superb.

This year, you can learn faceting from Steve Weinberger, who took over the job when Reivan retired.

While this retreat is a time for learning, it is also a time for fun. The entire event lasts a week, with a mid-week free day. Students can enjoy an organized field trip, or they can go to nearby Grandfather Mountain, which has a wonderful mineral collection that was originally assembled by my friend Jack Hannahan, now deceased. Grandfather Mountain also has a fine, small zoo that's worth seeing.

If you hanker to go collecting on the off day, you can get over to Spruce Pine, well known for its fee-digs/mineral shops. The mines there are known for sapphires, rubies, garnets, and other tiny gem bits. A very nice mineral show is held in Spruce Pine every year since there are so many mines and mineral localities nearby. Western North Carolina is a rockhound's paradise and a very interesting source of many mineral species. The pegmatite deposits around Hiddenite are particularly good collecting sites if permission can be obtained.

Another option on the day off is to go to nearby Ashville. It's a very nice, small city that boasts a famous Vanderbilt mansion you can tour. In downtown Ashville, there is a delightful mineral museum, The Colburn Earth Science Museum. It boasts fine interactive displays and has some very fine minerals, including a few of the uncommon hiddenite crystals. That there are a couple of fine restaurants in that same area is a good excuse to visit Ashville!

Tiffany & Co. gemologist George Kunz, at the behest of Thomas Edison, came to this area to investigate the possibility of raising goldenrod as a source of latex for rubber. That venture proved to be a waste of time, but Kunz did find some small, green beryllium crystals that proved to be a new species. It was named hiddenite. More recently, Jim Hill has been very successful mining gem em-



BOB JONES PHOTO

Funds raised at the Saturday night auction help defray costs for students who wish to enjoy Wildacres for a week.



BOB JONES PHOTO

The mid-week free day draws to a close with a student park-and-swap, held in the parking area at Wildacres.



ABOVE: In the 1500s, German geologist Georgius Agricola wrote *De Re Metallica*, which started scientists on the road to modern mineralogy.

LEFT: Wildacres faceting expert Reivan Zeleznik cut these labradorite gems from a rough crystal that was collected by Editor Bob Jones.

eralds at Hiddenite, crystals that are worth serious money.

The last night of the week is Fun Night. I suspect this resulted from rockhounds who were away from home letting their hair down. The setup is simple: folks volunteer to do something entertaining, wearing a costume or not. Some sing—or do a reasonable facsimile thereof—get together and perform a short skit, or play a musical instrument. It was at one of these retreats that I heard a dulcimer for the first time. Others tell jokes, some of which are actually funny. All in all, Fun Night is a great way to let off steam after a week of hard work at the machines.

To generate monies to help cover much of the cost of this really excellent week, an auction is held. Retreat attendees need pay only a partial fee as a result of the auction. As serious as this event is, it can also be rife with fun. When spouses bid against each other, folks react. Sometimes an item is sold, stolen, and sold again, much to the surprise of the original bidder. Evening entertainment here is typically a source of great amusement.

As for the food, it is excellent. Produce from regional and local farms keep things healthy. Meals are held family style at large tables so you can sit with friends or make new friends.

Wildacres is privately owned by a family with a philanthropic bent. The place is available to religious groups, nonprofit groups, musical groups, and the like. The sleeping arrangements are hotel-like, with two people sharing a room. Classes are held in regular classrooms that are well equipped with lapidary machines or faceting machines. Some materials are supplied, while students are charged a nominal fee for some things. What I like is the event where students can display and talk about their work at the end of the session. It is a show-and-tell event we always enjoy.

After dinner each evening, folks usually gather on the broad porches for a social

time. They rehash the day's events and talk about shows, club business, collecting trips, and anything else that comes to mind. After a glass of wine or two, the conversation gets pretty lively and events at Wildacres from earlier years get a good going over. This is the time to get to know folks from all over Eastern Federation territory.

My talks at Wildacres 2015 will be two-fold. Some are strictly educational, while others are based on some of my world travels. One educational talk I'll be giving has only been given at Tucson. It has to do with the evolution of modern mineralogy and crystallography. These two sciences really began to evolve in the 1500s. Prior to that time period, the knowledge gained from centuries of mining and mineral science was a well-kept secret within mining families. This meant that every generation had to start from scratch to learn about mining, smelting, refining and minerals.

That all changed with the publication of a book titled *De Re Metallica* in 1556. It was written in Latin by Georgius Agricola, née Georg Bauer. A doctor by profession, Agricola had tended the injuries of miners in the Joachimsthal area of what is now the Czech Republic. He was also very interested in mining and geology, and had observed and asked questions while hanging around the silver mines. What he learned, he wrote about in his book, the first accurate revelation of mining methods that anyone who knew Latin could learn.

Agricola had also written a book called *De Natura Fossilium* about minerals. Today, you can actually read these books, as they have been translated into English. Future President Herbert Hoover and his wife, Lou Henry Hoover, translated *De Re Metallica* in 1912. Hoover was a mining engineer, so he understood the technical terms of Agricola's book, and Lou was a geologist and Latinist. *De Natura Fossilium* was translated into English by Dr Mark Bandy and his wife, Jean, in 1955. Bandy was also a mining engineer.

Once Agricola's book made the secrets of mining, refining and smelting known to a wider audience. Scientists began to study the materials and record their findings, and mineralogy began to develop as a formal science which led to modern mineralogy.

Crystallography was not a real science at first. Remember, the Greeks thought quartz was simply ice that had frozen so hard it could not be melted. A whole string of scientists began to assemble their observations on crystals. In 1794, René Just Haüy wrote *Traité de crystallographie* (a treatise on crystals). As a result, he is considered the "father of modern crystallography". And it all started with Agricola.

Another one of my talks will deal with amethyst, a mineral we all know and love. After talking about its sources, its wonderful color, and its cause, I'll take listeners on a short helicopter trip to a gem mine about 7,000 feet above the Arizona desert, near where I live. The mine is located on Four Peaks, which are part of the Mazatzal Mountain Range, situated east of Arizona's capital, Phoenix. The violet gems from this site rank with the best from Russia, Georgia, Korea, or anywhere else.

Another of my talks will be centered on the periodic table of elements, that wall chart we all saw when we walked into a science classroom. This remarkable font of knowledge was the result of the study of minerals that began with Agricola. What is really amazing is that when the Russian chemist Dmitri Mendeleev first created a periodic table, there were only about 55 known elements. He was so astute in recognizing the relationship of properties between families of elements, however, that he was able to predict the properties of at least two then-unknown elements, which were later identified.

If you have not planned a vacation for this year, Wildacres is the natural choice. You'll have fun, learn more about the hobby, and enjoy the wonderful western mountains of North Carolina. 💎

ROCK & GEM Kids

Aegirine

$\text{NaFe}^{3+}\text{Si}_2\text{O}_6$

Many minerals are named for the place in which they were first found (benitoite was found along California's San Benito River). Others are named after people (goethite honors Johan Wolfgang von Goethe, a German writer, statesman and scientist).

Some minerals bear the names of gods. For instance, neptunite honors Neptune, the Roman god of the sea. The close lookalike mineral aegirine (sodium iron silicate) was also named for a sea god, but because it was discovered near the sea in Norway, it was named for Ægir, the sea god of Norse mythology. It was named in 1835 by Norwegian priest and mineralogist Hans Morten Thrane Esmark.

Aegirine (pronounced æ'-gir-in) isn't all that colorful—many specimens are greenish-black—but its long, prismatic crystals make nice display pieces, especially when nestled in white matrix. Perfect crystals have pointy pyramids on top and are usually opaque with vitreous luster. Black specimens look much like long, slender schorl crystals.

The greenish-black color may veer into brown or reddish-black, and thin edges may be translucent green. A fibrous greenish variety is known as acmite, and acmite is sometimes used as a synonym for aegirine. Although a dark mineral, aegirine leaves a pale yellowish-gray streak on a ceramic streak plate. Somewhat rare, it has no real uses other than as a collector's specimen.

In addition to localities in Norway, aegirine has been found on Russia's Kola Peninsula, at Narssârssuk in Greenland, in the



Canadian gemstone district of Mont Saint-Hilaire, Quebec, and at Magnet Cove, Arkansas, which is a source of many rare and unusual minerals.

—Jim Brace-Thompson

Kentucky's State Rockhound Symbols

Kentucky proves that laws are written by politicians, not geologists: Its state gemstone isn't a stone, the state mineral isn't a mineral, and the state rock isn't a rock!

Freshwater pearls became the state gemstone in 1986 thanks to appeals from schoolchildren. Pearls from mussels have been harvested in Kentucky since the 1800s, although the mussel population has declined greatly over the years. Technically speaking, pearls can be called gems, but not stones, so it would have been more correct to have designated them the state gem. Gemstones typically are minerals, which are inorganic (not created by living creatures).

Coal became the state mineral in 1998 thanks to efforts by students to recognize the importance of coal in Kentucky's economy. However, coal is classified by geologists not as a mineral, but as a rock of biochemical origin. Legally speaking, most states classify coal as a mineral resource, and politicians, after all, do like to speak legally rather than geologically.

Agate became the state rock in 2000. Agate nodules erode out of the Mississippian-Period Borden Formation. Collectors prize them for their dramatic bands of yellow, red, gray-blue and black. But agate is a variety of quartz, which is a mineral, not a rock, so it should have been proclaimed the state mineral.

The brachiopod became state fossil in 1986 thanks to the efforts of Louisville middle school students. Brachiopods resemble clams, but are a distinctly different animal group. Although rare today, in Paleozoic rocks (550 million to 250 million years old) brachiopods



Clockwise from top: coal, freshwater pearls, Kentucky agate, fossil brachiopod

are one of the most common fossils, and Kentucky hosts sedimentary rocks filled with them, particularly around "Falls of the Ohio", near Louisville. There are thousands of species of fossil brachiopods and, rather than designate a single species, they were chosen as a group to serve as state fossil.

—Jim Brace-Thompson

Mineral Namesakes

Use your mineral identification guide to match each mineral name with its source. If you get stuck, consult the answer key below.

ADULARIA AGATE ANDRADITE ANGLESITE BARITE BOBJONESITE COBALTITE ELBAITE HALITE INESITE KUNZITE
LAZURITE OLIVINE PLATINUM PYRITE SODALITE SPINEL STILBITE TURQUOISE ZIRCON



Zircon

1. Island of Elba _____
2. Greek, meaning "to glitter" (*stilbein*) _____
3. Turkish gem _____
4. Greek word for "heavy" (*baros*) _____
5. Gemologist George F. Kunz _____
6. Old Arabic for "heaven" (*lazaward*) _____
7. Adula Mountain range _____
8. Spanish word for "silver" (*plata*) _____
9. Mineralogist Jose B. de Andrada e Silva _____
10. Greek word for "fibers" (*ines*) _____
11. Island of Anglesey, England _____
12. Persian for "gold-colored" (*zargun*) _____
13. Olive-green color _____
14. Achates River, Sicily _____
15. Greek word for "fire" (*pyr*) _____
16. Sodium content _____
17. *Rock & Gem* editor Bob Jones _____
18. Latin word for "thorn" (*spina*) _____
19. Greek word for "salt" (*hals*) _____
20. German underground spirit (*Kobold*) _____



Kunzite



Cobaltite



Spinel



Halite

ANSWER KEY:

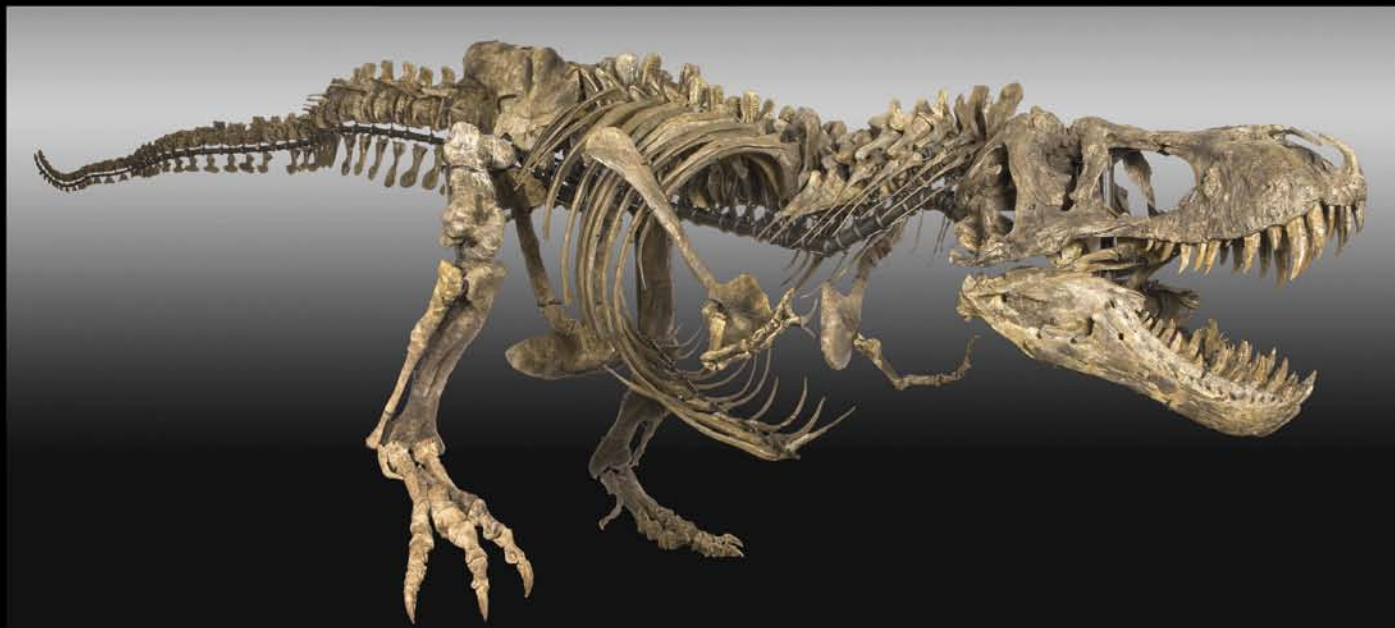
- | | | | | |
|--------------|--------------|---------------|--------------|-----------------|
| 1) elbaite | 5) kunzite | 9) andradite | 13) olivine | 17) bobjonesite |
| 2) stilbite | 6) lazurite | 10) inesite | 14) agate | 18) spinel |
| 3) turquoise | 7) adularite | 11) anglesite | 15) pyrite | 19) halite |
| 4) barite | 8) platinum | 12) zircon | 16) sodalite | 20) cobaltite |

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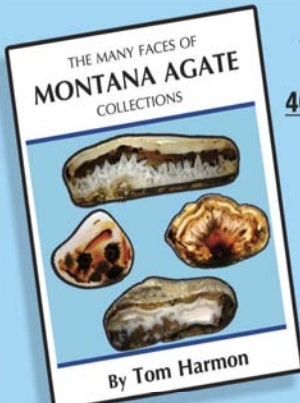
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This book is the author's third book on Montana Agate. The first was 'The River Runs North: A Story of Montana Agate' in 2000. He also co-authored 'The How-To's of Cabbaging and Carving: Montana Agate and Other Chalcedony's' with son Jim Harmon, in 2005.

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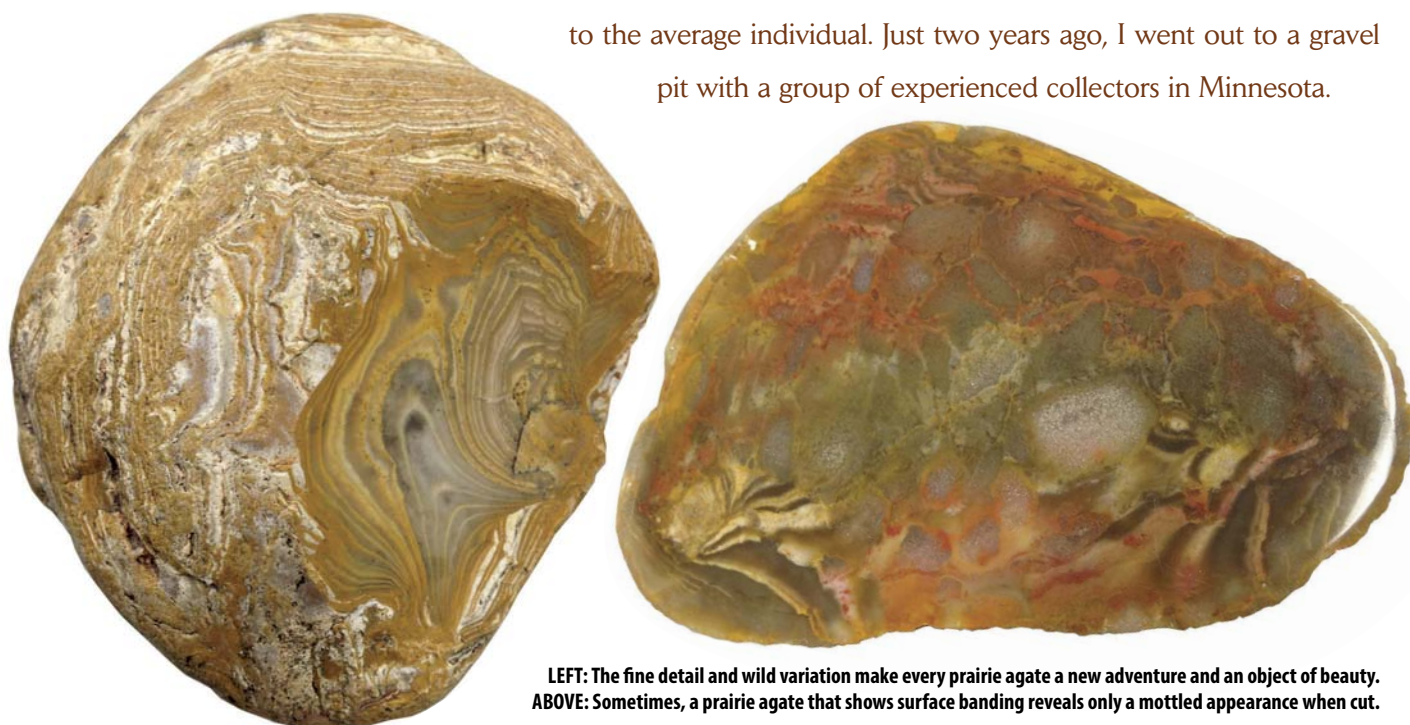
April 18 & 19 SANTA CLARA, CA Santa Clara Valley Gem And Mineral Society 60th Annual Show; Santa Clara County Fairgrounds; 344 Tully Rd., San Jose, CA 95111 Saturday & Sunday 10am - 5pm	April 24 - 26 DENVER, CO Colorado Mineral & Fossil Show - Spring; Ramada Plaza Hotel; Room #109 4849 Bannock St., Denver, CO 80216 Fri. & Sat. 10am - 6pm, Sun. 10am - 5pm	April 25 - 26 SANTA CRUZ Annual Santa Cruz Mineral & Gem Society Gem Show; Santa Cruz Civic Auditorium; 307 Church St., Santa Cruz, CA 95060 Sat. & Sun. 10am - 5pm	May 2 & May 3 SANTA CLARA, CA Searchers Gem & Mineral Society Gem Show; Brookhurst Community Center; 2271 W. Crescent Ave., Anaheim, CA Sat. 10am - 5pm, Sun. 10am - 4:30pm
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Praise for Prairie Agates

Golden-Brown, Banded Chalcedony from South Dakota and Nebraska

Story and Photos by David B. Rusterholz

Growing up in Minnesota and living in Wisconsin for much of my life, I have come to the conclusion that there are few collectible rocks or minerals out there that can compete with the beauty and delicacy of a good Lake Superior agate. Whether cut and polished or in their natural condition, these stones are appreciated for their vivid red, white and orange colors, their tight banding, and great variation in patterns, including eyes, tubes, and sagenitic inclusions. I have also greatly enjoyed becoming familiar with other varieties such as the Condor, Botswana, Queensland and Brazillian agates; however, living where I do, these are generally not accessible for me to collect personally. Even the Lakers are becoming harder and harder to find, as places in which one can search for these in an ethically responsible manner are becoming less and less available to the average individual. Just two years ago, I went out to a gravel pit with a group of experienced collectors in Minnesota.



LEFT: The fine detail and wild variation make every prairie agate a new adventure and an object of beauty.
ABOVE: Sometimes, a prairie agate that shows surface banding reveals only a mottled appearance when cut.



Gloves and kneepads are recommended at this collecting site, since prickly pear cacti are among the things that can be found there.

In two hours of searching, not one of the 20 of us was able to find a single Lake Superior agate of any size or quality worth mentioning.

Although many of us can enjoy just being in the out-of-doors with our heads down, walking along looking for pretty stones, it is much more rewarding to actually find a specimen or two of the thing you are looking for. As a friend of mine pointed out, "They call it 'fishing', not 'catching'!" But even the most avid fishermen would get discouraged if they never caught a fish.

Recently, I have had the happy experience of becoming aware of the abundance of the so-called "prairie agates" of South Dakota. Although some may regard the prairie agates as poor relatives of the other varieties, I am here to argue that they, too, have a special beauty that is worthy of attention. And importantly, they are plentiful enough that the average collector can easily acquire a good number of attractive specimens with a modest investment of time and effort.

Prairie agates can be readily found in the regions of South Dakota and Nebraska that lie to the east and



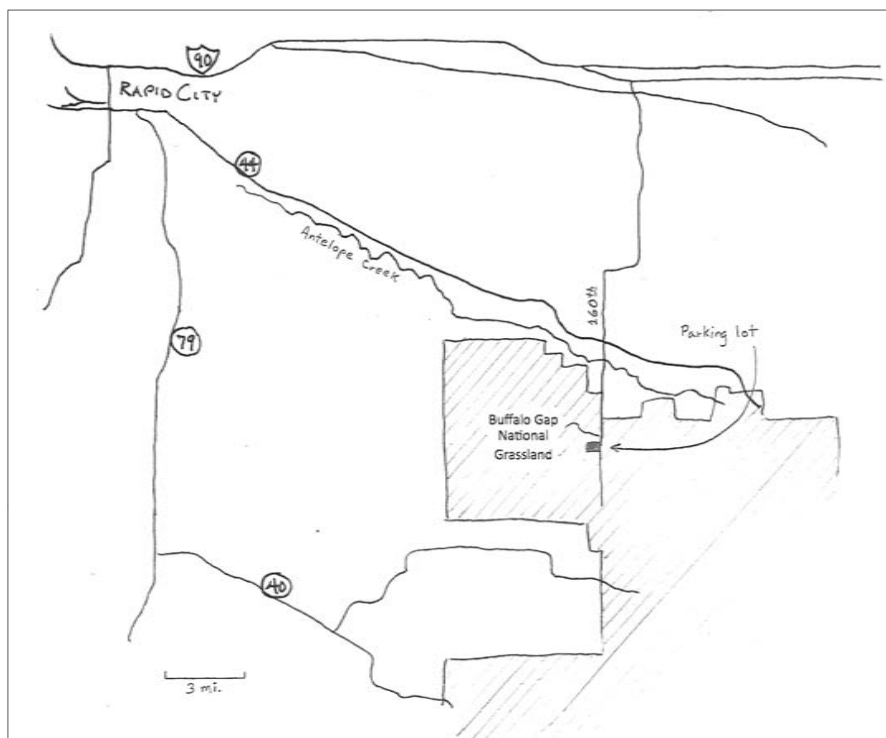
The red coloration found in many Lake Superior agates is less common in prairie agates, but provides a pleasing result when present.

southeast of the Black Hills. Fortunately, much of this land is part of the Buffalo Gap National Grassland or the Oglala National Grassland and is open for surface collecting by rockhounds. One can obtain further information about the Buffalo Gap National Grassland and maps by contacting the National Forest Service station in Rapid City or calling the Fall River Ranger District office in Chadron, Nebraska.

A very nice blog that includes directions to several collecting sites around the Black Hills area has been made available online by Jenn (<http://jedidiahfree.blogspot.com/2013/09/badlands-buttles-and-banded-agates.html#.VAiK2ihOjHN>). There are several nice online blogs that provide additional information about the occurrence and hunting of prairie agates, including www.agatehunter.com/prospecting.htm and markandrenita.blogspot.com/2010/06/prairie-and-fairburn-agate-hunting.html.

The Nebraska Government Web site, www.sos.ne.gov/symbols/rock.html, reports that in 1967, the state of Nebraska honored the prairie agate by choosing it to be its state rock.

A Web search for images of prairie



Several roads lead into the Buffalo Gap National Grassland. Our group entered from the north on 160th Street, via state Route 44 out of Rapid City.



The roads leading from the parking area are quite rutted. A four-wheel-drive vehicle or ATV is recommended.



The Buffalo Gap National Grassland lies to the east of the Black Hills and is open to surface collecting by rockhounds.

agates brings up a host of outstanding samples. Additional information and guidance is also available from the friendly members of the Western Dakota Gem & Mineral Society. And if you really don't want to go out into the field yourself, the Dakota Stone Rock Shop in Hill City has a bin of prairie agates available at \$3 per pound.

There are several roads by which one can access the Buffalo Gap Grasslands. Our group left Rapid City driving southeast on state Route 44 for approximately 16 miles before turning right onto the Farmingdale-Folsom Road, also known as 160th Ave. The pavement ends soon after crossing Antelope Creek, and about two miles farther on, a wide parking lot appears on the right-hand side. We parked our main vehicles there and proceeded to the west on a side road using all-terrain sport vehicles. One can walk these side roads; however, we were traveling inland about three to four miles, and the ATVs made the trip quicker and hauling out our finds easier.

The side roads are quite rutted, and the high clay content of the soil can make them totally impassable after a rain. There had been a light rain the day before we arrived. In the parking lot, the clay stuck to our shoes until they tripled in size and weight, but after a short while in the drying sun, we were able to proceed inland.

The occurrence of prairie agates to the east of the Black Hills is similar in distribution to the areas where the beautiful Fairburn agates are found. Roger Clark, in his book *Fairburn Agate: Gem of South Dakota*

(Silverwind Agates, 2002), has suggested a possible scenario describing the origin of Fairburn agates in the Minnelusa limestone of the Black Hills, their subsequent release from matrix, and their transportation to the Fairburn region. One can conjecture that the prairie agates, being distributed in a similar spatial pattern and being chalcedony nodules, may have had a somewhat similar origin.

The fact that the prairie agates do not have the same tight banding and holly-leaf pattern characteristics that the Fairburn agates are known for means that the conditions leading to the development of a prairie agate were in some way different than those of the Fairburn. Just exactly how agates are formed is still debated in many circles. Karen Brzys has provided one thorough description in her book *Agates Inside Out* (Gitche Gumees Agate and History Museum, 2010), and Clark has offered his vision, as well.

That the prairie agates are indeed "agates" perhaps requires some further argument. I regularly get asked by lay individuals, "What makes this stone an agate, and that a piece of jasper (or chert or flint)?" Indeed, all of these terms refer to materials that are basically cryptocrystalline quartz. As a result, all of them are typically hard enough that they can be polished to a fine, glassy surface that can reveal the underlying patterns, however attractive.

In my opinion, true agates show parallel banding and have translucent quartz as a major component. The colored bands are

produced by impurities, other minerals, or microscopic inclusions. As the percentage of included foreign minerals becomes higher, the resulting stone becomes more and more opaque. I would then call the stone jasper or chert.

There are, of course, exceptions to this rule, such as moss agates or dendritic agates that have a high percentage of translucent quartz, but totally lack any parallel banding. And there are some fine examples of banded jasper that show nice parallel banding, but are minimally translucent. Some have proposed bridging the gap between agate and jasper with the name "jaspagate". In Minnesota, much of what I call jasper has a strong iron-red coloration, chert is a rusty yellow, and flint is gray. Examples of these latter stones showing agate-type banding are called "banded jasper" or "banded chert".

The prairie agates themselves can be found in a wide variety of styles. One of their most evident features is the coarseness of their banding. In contrast to other agate varieties that show narrow, light or dark bands, often only 0.5 mm to 2 mm in thickness, the width of bands in prairie agates is often 3 mm to 10 mm or more. The dominant coloring in the prairie agates that I found is generally a blond, golden brown alternating with white and pale-blue chalcedony. Many of these exhibit a repeated "scoopy" pattern.

My friend Sue Gogerty prefers the dark blue-black variety with pale white lines. Additionally, we found many specimens that lean toward the banded jasper end of the spectrum, with multicolor, variegated patterns with an overall opaque presentation.

Many times, the banding of the prairie agate is superficially revealed on the stone's surface, reminiscent of the "peeler" variety of Lake Superior agates.

Many prairie agates have a blond, golden-brown coloring alternating with white and pale-blue chalcedony.



Many times, the banding of the prairie agate is superficially revealed on the stone's surface, reminiscent of the "peeler" variety of Lake Superior agates.



Tumbling can often reveal the beautiful surface patterns of a prairie agate.

way share a similar genesis with other, better-known and more recognized agate types.

However they are classified, the prairie agates of South Dakota can be found fairly easily. In four hours of hunting, each of us in my group came away with about 5 gallons of material deemed worthy of a second look. From that, much was suitable for cutting, polishing or tumbling. The remainder now enhances my "outdoor rock collection" in my backyard.

There are a variety of other attractive stones that can be found along with the prairie agates, including a generous supply of petrified wood in some interesting shapes and colors. Most importantly, prairie agates are freely accessible, and collecting them makes a most enjoyable and rewarding field trip for an individual or a rock club. 💎

Tumbling can often reveal the beautiful surface patterns of a prairie agate.



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Show Dates from page 10

time.; contact Lowell Carhart, 80 Roslyn Forest Lane, Charlottesville, VA 22901, (804) 291-6357; e-mail: LowellCarhart@yahoo.com; Web site: www.NY-NJ-Show.com

10-12—OGDEN, UTAH: Annual show; Golden Spike Gem & Mineral Society and NFMS, Golden Spike Event Center, Weber County Fairground; 1000 N 1200 W, GPS: 1181 N Fairground Dr.; Fri. 9:00 am-6:00 pm, Sat. 10:00 am-6:00 pm, Sun. 10:00 am-4:00 pm; Admission \$3.00 Donation, Students \$1.50 Donation, Children 12 and under and Scouts Free with an Adult; 63rd Gemstone Junction; Golden Spike Gem & Mineral Society; Donations: \$3.00 Adults, Children 12 and under Free with an Adult, Student \$1.50, and Scouts in uniform Free with their Leader. Over 25 Dealers, Displays, Exhibits (competitive and hobbyist), Demonstrations, Geode splitting, Door Prizes, Silent auction. Rocks, Minerals, Jewelry, Beads, Gemstones, Equipment, Supplies, Fossils, Wood, Findings, Gold panning, Knapping, and more. For the Young at Heart: Mr. Bones and his Walking Dinosaurs, Grab Bags, Wheel of Fortune, Sapphire screening, and more. Free Parking.; contact Marie or Les Tryon, (801) 782-5664 or (801) 528-8998

10-12—EDISON, NEW JERSEY: Annual show; Eons Expos, LLP, NJ Convention & Exposition Center; 97 Sunfield Avenue; Fri. 12 pm-9 pm, Sat. 10 am-6 pm, Sun. 10 am-6 pm; Adults \$10, Students \$5, Children are Free; 400 vendor booths and 14,000 visitors makes this the largest Mineral, Fossil, and Gem Show east of the Mississippi River. The 'Mindat.org Speaker Series' will feature presenters from around the world. A huge display of glowing UV minerals from all major sites on Earth will be featured in our darkened Junior Ballroom (presented by the Franklin Mineral Museum and Sterling Hill Mining Museums). Activities for the kids include sluicing, and every child over 5 will receive a UV rock upon entry -- so they will want to rush to the UV room to see in which color that it glows. A 2,000 sq foot section in the middle of the show will highlight large specimens of dinosaurs and other fossilized life. For business-to-business transactions, there will be a separate 20,000 sq. ft. 'Wholesale Only' section. Entry is \$10 for those over 12 years old, just \$5 for kids between 5 and 12, and under 5 are free. Parking is free. The full-service cafeteria can seat 100 people at a time.; contact Hetaher Grana, 235 First Avenue, Keyport, NJ 07735, (973) 903-3256; e-mail: Heather@EonsExpos.com; Web site: <http://www.NY-NJ-GemShow.com>

11-12—MARIPOSA, CALIFORNIA: Annual show; CA State Mineral Museum and Mariposa Club, Mariposa Fairgrounds; Highway 49 and Fairgrounds Rd.; Sat. 10.00-5.00, Sun. 10.00-4.00; Adults \$3, Seniors = Free, Students = \$2, Children = Free; Includes full access at no extra charge to California

State Mining & Mineral Museum on the same property. See the giant Fricot gold nugget back on display this year.; contact Martin Foden, (209) 742-4036; e-mail: martin@safarigold.com; Web site: <http://www.camineral-museum.com>

11-12—YAKIMA, WASHINGTON: 54th Parade of Gems; Yakima Rock & Mineral Club, Central Washington State Fair Grounds; Modern Living Building, 1301 S. Fair Ave.; Sat. 10-6, Sun. 10-4; adults \$3.50, seniors and students \$2, children (under 12) free with adult; displays, dealers, rough rock, finished jewelry, specimens, lapidary equipment, demonstrations, cabbing, wire wrapping, silent auction, door prizes, raffle, spin the wheel, grab bags, gold panning; contact Marti Sondgeroth, 2013 S. 41st Ave., Yakima, WA 98903, (509) 248-6401; e-mail: marthams@q.com

11-12—MARION, ILLINOIS: Annual show; Southern Illinois Earth Science Club, Pavilion of the City of Marion; 1602 Sioux Dr.; Sat. 10-6, Sun. 10-5; adults \$2, children (18 and under) free; gems, minerals, fossils, lapidary, fluorescent light shows, door prizes, silent auctions; contact Mike Chontofalsky, 1019 E. Broadway, Centralia, IL 62801, (618) 532-0455; e-mail: chontofalsky@att.net; Web site: siesclub.org

11-12—ABILENE, TEXAS: Show and sale; Central Texas Gem & Mineral Society, Abilene Civic Center; N. 6th and Pine; Sat. 10-6, Sun. 10-4; adults \$3, students (6-12) \$1.50, children (under 6) and Scouts in uniform free; exhibits, Wheel of Fortune, dealers, fossils, rare minerals, cut and uncut gems, fluorescent display, lapidary supplies and rough, jewelry making equipment, beads, crack your own geode, silent auction, door prizes, grand prize drawing; contact Kay H. McDaniel, 3118 Woodglen Cove, Abilene, TX 79606, (325) 668-8558; e-mail: kmcDaniel23@suddenlink.net; Web site: rockclub.txl.net

11-12—JOHNSON CITY, NEW YORK: Annual show; New York Southern Tier Geology Club, Johnson City Senior Citizens Center; 30 Brockton St.; Sat. 9-5, Sun. 10-4; adults \$3, children (under 12) free; club exhibits, silent auctions, dealers, minerals, fossils, gems, lapidary, jewelry; contact Tom Ogden, 96 Main St., Bainbridge, NY 13733, (607) 967-8552; e-mail: tandjogden@stny.rr.com

11-12—ORANGE, CONNECTICUT: Annual show; New Haven Mineral Club, Amity Middle School; 100 Ohman Ave., off Rte.34; Sat. 9:30-5, Sun. 10-5; adults \$5, children free with adult; minerals, gems, jewelry, fossils, exhibits, dealers, door prizes, lectures, demonstrations; contact Art Doyle; e-mail: president@newhavenmineralclub.org; Web site: newhavenmineralclub.org

11-12—CANTON, OHIO: Annual show; Stark County Gem & Mineral Club, Stark County Fairgrounds; 305 Wertz Avenue NW;

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11-12—DOVER, NEW HAMPSHIRE: Annual show; Southeastern New Hampshire Mineral Club, Veteran's Community Center; 156 Backwater Road; Sat. 10 am-4 pm, Sun. 10 am-4 pm; Adults \$3.00, Children under 12 Free if accompanied by an adult; ; contact LARRY HEATH, 20 Ash Drive, Kingston, NH 03848, (603) 642-8601; e-mail: heathlg@comcast.net; Web site: www.senhmc.org

11-12—COLUMBUS, OHIO: Annual show; Columbus Rock and Mineral Society, Licking County Rock and Mineral Society, Northland Performing Arts Center; 4411 Tamarack Blvd.; Sat. 10:00 am-6:00 pm, Sun. 11:00 am-5:00 pm; Adults \$7.00, Seniors \$6.00, Students \$3.00, Children under 6 Free; 2015 theme: Frozen: Ohio's Ice Age. Scouts in Uniform and Teachers with a school ID are free. Large children's area with dozens of educational exhibits, children's games and educational activities. Special speakers at 1:00 and 3:00 Pm Saturday and 2:00 Pm Sunday. Free specimen ID booth, demonstrations, hourly and grand door prize, case exhibits, silent auction and large dealer variety. ; contact Craig Kramer, 628 Sanbridge Circle E., Columbus, OH 43085, (614) 436-4511; e-mail: craig.kramer@wowway.com; Web site: www.columbusrockandmineralsociety.org

11-12—SILOAM SPRINGS, ARKANSAS: Annual show; Northwest Arkansas Gem and Mineral Society, Community Building of Siloam Springs Arkansas; 115 S Mount Olive; Sat. 9:00am-5:00pm, Sun. 10:00am-4:00pm; Adults \$3, Seniors \$3, Students \$2, Children Free under 8; Like us on Facebook; contact Dave Leininger, 14029 White Oak Lane, Bentonville, AR 72712, (479) 721-1579; e-mail: hulagrub@aol.com; Web site: www.nwarockhounds.org

17-19—SAN DIEGO, CALIFORNIA: Wholesale and retail show; Gem Faire Inc, Scottish Rite Center; 1895 Camino del Rio S.; Fri. Noon-6pm, Sat. 10am-6pm, Sun. 10am-5pm; Adults \$7, Children Free (ages 0-11); Fine jewelry, precious & semi-precious gemstones, millions of beads, crystals, gold & silver, pearls, minerals & much more at manufacturer's prices. Exhibitors from around the world. Jewelry repair & cleaning while you shop. Free hourly door prizes.; contact Yooy Nelson, (503) 252-8300; e-mail: info@gemfaire.com; Web site: http://www.gemfaire.com

17-19—RICKREALL, OREGON: Show, ; Willamette Agate & Mineral Society, Polk County Fairgrounds; 520 S. Pacific Hwy. West; Fri. 9-6, Sat. 10-6, Sun. 10-4:30; adults \$2, children (under 12) free; contact Etheleen Flippo,

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WHAT TO CUT

by Scott Empey

Oregon Tube Agate

Oregon is home to a truly amazing array of fine agates. They include many types of agate, jasper, opal, and petrified wood, along with a staggering variety of thunder eggs. One of my favorite types of agate from Oregon—and I have quite a few—is the gorgeous, white tube agate.

There are two locations in the state that produce similar-looking tube agate: one is the Coyle Butte area of the Ochoco Mountains, and the other is Keegan Ranch, in the high desert near Ashwood, Oregon, about 30 miles north of Prineville.

The Keegan ranch borders the McDonald Ranch, and the tube agate bed crosses the boundaries of the two ranches. The Coyle Butte agate is also called "Quant's tube agate", after legendary rockhound Shirts Quant. Shirts was a prolific miner whose discoveries include the famous Carey plume agate, Eagle Rock plume agate, the limb cast area at the South Fork of the Crooked River, and the Ochoco tube agate deposit.

The tube agate from both locations is generally a clear agate with a variety of white tubes, flowing bands, and wispy feathers, with occasional pockets of sparkling druzy.

The Ochoco tube agate site is located in one of the most picturesque sites for digging agates: a beautiful, grassy meadow surrounded by a pine forest. The agates are generally seam agates, and are found by digging in the soil of the meadow. The local clubs still run digging trips out to this lovely location.

When cutting this agate from rough, it's a good idea to take a good look at the piece and determine the direction of the tubes and the way the patterns change when viewed from different angles. If you cut directly across the grain, you will get strongly defined tubes and eyes. Cut along the grain, and the tubes lengthen out, resulting in a more flowing pattern. I usually cut them slightly off angle from directly across the grain. This way you can get the tubes and eyes with the distinct patterns, but they kind of trail back into the background.

One way to work with white tube agates is to back them with another material. This results in a darker stone and can make the details stand out better. Usually, people use a black background like basenite or black onyx, but there is no reason a more colorful material couldn't be used.

To back a cab, I usually trim up the outside shape of the agate and then trim a



piece of the backing material so it is just a little bit bigger. The reason for trimming it close this way is to avoid the need to use the saw or any really rough and jarring grits after I epoxy the two together, so as not to undermine the bond. I polish the two sides that will be attached to a 400 finish before epoxying, so there is not a frosted layer between the two pieces. For any job like this, I use a two-part one-hour epoxy, like Epoxy 220, and let it cure overnight under low heat; I usually just put it on the top of the heater or steamer.

A lot of people will tell you that 30-minute epoxy makes just as good a bond, but it really doesn't; even after years, the 30-minute variety will be somewhat rubbery, whereas the slow-setting one-hour type will be hard as a rock. After bonding the two pieces, I do the rest of the rough shaping using a 260 grit disk, which seems to be gentle enough, and then grind and sand through the usual steps. Just make sure that you keep the addition of epoxy in mind and use lots of water to keep the piece cool. 💎

Scott Empey, owner of Gerard Scott Designs, creates hand-cut gemstones, designer jewelry, and props for the motion picture industry. His Web site is www.gerardscottdesigns.com.





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The Peebles Ranch site became significant in 1979 because it yielded one of the largest finds of embryos, eggs, nestlings, and adult dinosaurs.

Montana's Two Medicine Dinosaur Center

Story and Photos by Julie Binko

The Brandvold and Trexler families in Bynum, Montana, founded the Two Medicine Dinosaur Center in 1995. The main goal of the facility is to collect and preserve Montana fossils for scientific and educational experiences. Dave Trexler, the staff paleontologist, is no stranger to dinosaurs. He has an advanced degree and his family has been in Montana for over 100 years carrying on the tradition of prospecting for finds. His mother, Marion Brandvold, found the first duck-billed hadrosaurous (*Maiaasaura peeblesorum*) hatchling at Peebles Ranch on a day of prospecting.

This site became significant in 1979 because it yielded one of the largest finds of embryos, eggs and nestlings, as well as adult dinosaurs. Scientific discoveries furthering the study of the social and environmental life of dinosaurs were carried out here, and the site was dubbed Egg Mountain.

Walking with a paleontologist has always been on my bucket list, so volunteering at the Two Medicine Dinosaur Center was a dream come true. The center's newsletter put out the call for a Member Dig the weekend after Labor Day. I phoned the center and spoke with Dave. They were digging on a site and needed people to help close it for the winter. Since I was driving from Minnesota to Montana, I also offered my services in the preparators' lab for an additional four days. He immediately accepted my humble offer.

For the two-day dig, I traveled with Dave and two staff members, Matt and Stacia, to ranch land near Augusta for the excavation microsite. As we traveled along the east side of the Front Range of the Rocky Mountains, I reminded myself that when the dinosaurs roamed this area, the Cretaceous Seaway was spread out across this landscape and the Rocky Mountains were emerging slightly farther to the west than they are now. As we entered the ranch land, the valley widened between the buttes and mountains to the west and flat plains and badlands to the east. The badlands are remnants of glacial scarring. The Rocky Mountain Front had been pushed with a straight-upward thrust of such force that Cambrian rock was forced to the surface—the forces awe me.

The center's excavation work at the microsite had been completed for the season, which runs from May through September. Our task for the next two days was to remove the jackets from the site that had been put in place to prevent bone shatter dur-



At this site, there were small jackets with a multitude of bones and a bison skull that were carried to a pickup for transport to the center.



With the matrix removed, the skull size and horn revealed that they belonged to an older and larger bison, rather than a modern one.

ing the winter months. Bone shatter is a process by which moisture and cold work together to enter the bones and make them crack or explode. We first dug around the jackets, leaving a pedestal of matrix and dirt beneath them. Dave kept apologizing that this dig was not teaching, but doing. I was ecstatic with the quick-paced removal of the jackets. Most dig work is not as exciting as it seems in the movies; rather, it involves detailed and careful removal of matrix with ice picks, small chisels, and brushes.

After the pedestals were complete, several points were marked on the jackets using a numbering system for later identification. Matt set up a device similar to a surveyor's transit to map the placement of the bones in the site. This information was also hand-drawn in a journal for the site. Each day, the details of the excavation were documented. Since this site had been open three years, it had already at least seven journals of documentation. As Matt reiterated, "It is not science unless it is written down."

At the site, both Dave and Stacia collected flora samples and studied the stratigraphy of the site. By collecting flora, paleontologists identify the plants present, and studying stratigraphy reads the rocks for evidence of geologic events, like high or low water. This information is all documented and helps to flesh out a picture of what the environment was like at the time when these dinosaurs lived.

After all the documentation was completed for each jacket, the removal of the jackets from the site began. Depending on the size of the jacket, they can be removed by hand, but larger jackets are usually lifted with motorized machinery like Bobcats or even helicopters. The jacket is chiseled off the pedestal and tipped over. At this site, we had small jackets with a multitude of



The microsite had been excavated for the season and jackets had been applied to stabilize the bones.

bones and a bison skull. These jackets were lifted or placed on a skid to slide them into a pickup truck. Any remaining exposed bones were covered with about 3 inches of sand. A drainage channel was dug to draw water away from the bones and left for next season.

After two days in the field, I was ready to spend some time in the preparators' lab. The director of the center, Cory, oriented me to some of the tools and techniques used in removing matrix from the skeletons. I do some lapidary arts, and most of the tools are similar. I found, however, that the tools are used to a different effect. For example, dental picks are used for

scraping matrix away from dinosaur bones, rather than as a lapidary casting tool, and Foredom tools were used to refine casts of bones.

After a quick tutorial, Cory had me tackle a mass of Triceratops bones. It took very detailed work to slowly bring the surface of the matrix slightly below the bone surface level. Using a system of scratching away the matrix with a dental pick, then wetting the area with water and scratching some more was the most accurate way to make progress. (Wetting the matrix turns it into a different color, while the fossilized bone remains roughly the same in color.) Within a few hours, I had one rib bone uncovered

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"To Collect and Preserve" from page 55



The bison skull was lifted up a slope using a winch and the skeleton was left for next season's work.

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The Triceratops bones in the foreground were recently brought from the Fort Peck Field Station. After preparation, they will be housed at the center for study.



Even though the surface of the skull was now consolidated, it would take many hours to clean eye sockets, teeth, and the internal areas of the skull to complete the preparation.

and discovered another bone crisscrossed below it. At that point I stopped, because each bone must be removed a layer at a time; uncovering the second bone would make the fossil unstable. With this tedious labor, it is easy to see why fully prepared dinosaur skeletons are worth millions of dollars!

Since I needed to stop working on the Triceratops skeleton, Dave brought out the bison skull we had brought in from the field the day before. Unsure of what would be revealed, I worked with a dental pick and brush to remove enough matrix from the jacket to warrant the removal of the skull. We partially pulled the jacket away from the skull after the first day, since it was not supporting the skull and it prohibited me from clearing away more matrix.

Dave checked into the lab with his tape measure on the second day and began taking the dimensions of the skull. At first he was quiet, but after several hours of me cleaning and some hours of research, he determined this was not a modern bison. He still needed to see it upright, but judging from the size of the skull and the position of the horns, it was a *Bison antiquus* dating back at least 10,000 years.

Now that a potential identification of the skull was made, I had renewed motivation. In order to remove the jacket and flip the skull upright, I needed to consolidate the visible skull. To do this, I used a dental pick to scrape away all debris and calcification from a small section about 1 inch by 2 inches at a time. The reason for this was that old bone exposed to air deteriorates rapidly. After scraping the debris away, I cleaned the area with acetone or water and then repeated scraping until it was clean.

When that section of the skull was clean and dry, Butvar® polyvinyl butyral resin was applied to stabilize the bone. It was cleaned and dried repeatedly for the rest of the day. I also applied many more layers of Butvar to the fragile teeth and palate of the skull. They would hold most of the skull's weight when it was removed from the jacket and flipped.

When I finished consolidating the bottom of the skull, Dave came in to remove the jacket. He used a hydraulic rotary saw to cut the jacket, then carefully peeled it away from the skull. It was then ready for me to start removing the matrix from the top and finish the consolidation process. When I finished my fourth day, the skull had been about 50% consolidated. Examining the upright skull further made Dave consider the possibility that this bison might actually be *Bison priscus*, which dates back as far as 200,000 years. Until the remaining skeleton is excavated and the site undergoes further consideration, identification will not be complete.

I will have to wait another season to dig dinosaurs, but if you have any interest in the areas of archaeology or paleontology, you should spend some time at the Two Medicine Dinosaur Center. The center is located on 2nd Avenue, just off U.S. Highway 89, about 66 miles northwest of Great Falls. The center is located about an hour south of Glacier National Park on the Eastern Front of the Rocky Mountains. You can visit the museum and lab or work with a paleontologist in the field. You can sign up for field experiences ranging from a half-day introduction, several multiple-day experiences, or a 10-day field course for college credit. For details, visit www.timescale.org.

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PICKS & PANS

News and Reviews

John Ford's Lightning Ridge Collection at the Oscars

Designs from the Lightning Ridge Collection of black opal and diamond jewelry created by John Ford added to the opulence of the February 2015 Academy Awards ceremony. Access Hollywood host Shaun Robinson broadcasted from the red carpet wearing a ring set with a 4.07-carat black opal accented by 1.78 carats of diamonds in 18k white gold.

Libby Villari, an actress in the Oscar-nominated film "Boyhood", wore a rare matched pair of black opal and diamond earrings with 5.05 carats of black opal and 1.58 carats of diamonds set in 18k white gold.

Celebrity stylist and television personality Michael O'Connor presented several pieces from the collection to celebrities. Other stars who wore Ford's designs include Maitlan Ward, Nicole Allowitz, Adina Porter, Jennifer Aspen, Marison Nichols, Kate Flannery, Sue Facter, and Breeda Wool.

John's recent ascent to being one of the top jewelry designers in the country has received much attention as a "David and Goliath" story. He has been honored by Fashion Q+A UK (2012), Cheryl Kremkow of Jewelry Trends From The Red Carpet To The Jewelry Box (2013), the American Gem Trade Association and the Platinum Guild International (2014).

Ford sources Black Opal exclusively from Lightning Ridge Australia for his black opal jewelry designs. See his designs at www.LightningRidgeCollection.com.



Ecological Gold from Mongolia

For the first time ever, an artisanal and small-scale mining organization outside of South America has achieved Fairmined Certification. The Mongolian NGO XAMODX is now the fourth Fairmined certified organization. It is the only producer of Fairmined Ecological Gold, a special Fairmined label for Fairmined Gold produced without the use of mercury or cyanide.

This mining community of around 2,000 people came into being back in 2006, when difficult weather conditions led herding communities to search for alternative livelihoods. They moved to an abandoned mine site called Tsagaan tsakhir, in the Bayan-Ovoo Soum territory. There, they began to focus their activities on mining. Less than 10 years later, they have claimed the title of the world's only organization with Fairmined Ecological Certification.

XAMODX has enjoyed the support of the Sustainable Artisanal Mining (SAM) Project of the Swiss Agency for Development Cooperation in Mongolia. The SAM project provided organizational capacity strengthening, safety and environmental training, and mining site management.

Women miners participate actively in the leadership of XAMODX. As a Fairmined certified organization, XAMODX will be able to export its gold to ethical markets at a fair price and make further important improvements to its mining organization and to the local community.

Fairmined Certification was created by the Alliance for Responsible Mining (ARM), a nonprofit organization globally recognized as a leader and pioneer of responsible artisanal and small-scale mining. For more information on Fairmined and how to source gold from XAMODX, visit www.fairmined.org or e-mail info@fairmined.org.



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Snow-White Specimens in the Ozarks

Story and photos by Mark Leatherman

I was just starting out with my graduate school studies at the University of Missouri—Columbia when I was first introduced to the beauty of the Ozarks. My advisor, Dr. Martin Appold, and his doctoral student, Zach Wenz, were preparing a short field expedition to collect sphalerite (ZnS) samples for fluid inclusion studies on Mississippi Valley Type (MVT) ore deposits. In wanting to be an oh-so-helpful and eager new student, I politely asked if I could go along as an assistant and get some field experience. They obliged and a few days later, we were off southward for my first taste of the Ozarks.

We drove south on U.S. 63 into Jefferson City, Missouri, and hopped on U.S. Highway 54 southwest past the capital city for the vast remainder of our short expedition. After a couple short stops at two locations in the woods with no luck in sample collecting, we headed to our most promising locale, the Gollar mine just outside of the town of Eugene. After driving 0.3 mile slightly downhill a semi-rough gravel road, we knew we had arrived when we sighted a flooded pit lake to our left, and a wide-open field in front of us for parking.

After splitting up into teams for a bit, none of us found the scientifically coveted sphalerite, but I couldn't help but notice a massive amount of barite (BaSO_4) and some galena (PbS) lying around. When we started on our way back to Columbia, I made sure to take notes on how to get back here on my own for some collecting.

About a year had passed since my initial trip. I had also just married someone who loved the outdoors and new adventures, and her childhood hobby of picking rocks was revitalized by virtue of having a geologist beau. It was June 2011 when she said, "It's such a gorgeous day out for a picnic! How about we go to that collecting site you told me about with your advisor?" I could never say no to such a request. We packed a small cooler with sack lunches and water, and with her dog in tow, we set off southward, guided by my trusty orange field notebook.



If one is lucky, boulders with protruding galena can reveal much more appealing treasures on the inside.

Along the way, my curious wife, Rebecca, asked me about the area mineralogy, what to look for, and how everything came to be. I'm not sure which excited me more, talking mineralogy or going out seeking it! The Gollar mine is one of the larger sites encompassed in an area known as the Central Missouri Barite District.

The district is, in turn, part of the U.S. Midcontinent MVT lead-zinc ore system, named for the remarkable concentration of lead (galena) found in the Mississippi River Valley area of southeast Missouri. The MVT system actually stretches roughly 750 miles from the Tri-State District in Oklahoma, Kansas, and southwest Missouri to eastern Tennessee, and roughly 575 miles from northern Arkansas all the way up to southwestern Wisconsin.

The mineralogy of MVT deposits, compared to other ore deposits, is quite simple with the dominant minerals being galena, sphalerite, fluorite (CaF), barite, calcite (CaCO₃), and dolomite. What makes this regional system even more remarkable is how the dominant mineralogy can change in such a relatively short distance. Starting in the Tri-State District, going east the ore is more zinc-rich, transitioning to barite-rich in central Missouri, then lead-rich in southeast Missouri, followed by fluorite-rich in southern Illinois and western Kentucky, and going back to zinc-rich in central Tennessee. The variances in mineralogy are probably controlled by varying lithologies serving as metal and sulfur sources, bedrock structures (such as carbonate dissolution), and even deep-seated igneous plutons (serving as a source of fluorine).

A much greater understanding of MVT deposit origin has been gained over the past 15 to 20 years with the advent of more advanced analytical instrumentation. One such powerful tool is laser ablation



Small hammers are all that are needed to have much fun and take home multiple kinds of finds.



mass spectrometry, coupled with traditional fluid inclusion analysis. Laser ablation has the ability to measure minute concentrations (down to parts per billion) of elements within micro-droplets of fluid trapped within a growing crystal (fluid inclusions). Along with trace element composition, a variety of tests can be performed on inclusions to gain information such as fluid temperature and salinity of hydrothermal fluids during crystallization.

Thanks to these techniques, the current prevailing theory on MVT formation is linked to tectonic uplift of several regional plateaus and associated neighboring sedimentary basins. Heated groundwater, ranging from 80°C to 150°C, flows down from the plateaus to the basins that serve as the centers of mineralization. In order for the massive amounts of sulfide ore mineralization to locally occur, separate flows of groundwater are required to transport metals and dissolved sulfur (or sulfate).

Fluid inclusion studies reveal that if a single fluid carried all necessary components, a smattering of subeconomic deposits would result and we wouldn't come close to the sheer volume of ore available for exploitation. In the case of the Central Missouri Barite District, high-grade mineralization is concentrated in open spaces associated with breccia-collapse structures in the Lower Ordovician Jefferson City dolomite.

As mentioned, the most likely scenario of barite genesis involves mixing separate bodies of groundwater, each being individually saturated in barium and sulfate (SO_4^{2-}). Fluid inclusion analysis of barite and trace sphalerite indicates the latter being deposited first, with barite being a later stage mineral.

Upon arriving again at the open gravel parking area, we decided to satisfy our appetites first with lunch in our car. After making sure we were equipped with water and our own hammer sets, I briefly showed her the pit lake and a few spots that I found desirable during my first go-around. Some of the initial hotspots included some large boulders in the open field, a small spoils pile just inside the vegetation line north of where we parked, and a small ground outcrop off of a four-way dirt-road intersection (roughly 600 feet to the southwest).

Being the fast learner that she is, Rebecca elected to go off for some self-exploring right from the get-go. While she decided to check out some open field boulders first, I started at the small spoils pile just a few paces from our car. There are cobbles and boulders of anhedral, opaque, snow-white barite everywhere for the taking, which definitely made deciding what (and how much) to keep and throw out quite a "heavy" task—no pun intended!

After starting a keep pile by the car, I gave the spoils pile a second lookover and discovered a small, but pleasant, surprise I



Although the vast majority of the barite is massive in form, some areas can display some fine bladed habits and small transparent areas.



The blue and green hues of chalcopyrite are the most commonly found here and are easy to spot in the field against the barite backdrop.



Galena cubes of varying and appreciable sizes (left) can easily be found, while smaller crystals of root beer sphalerite (right) require some more digging and hammering.



The area diggings make getting around the area both quite easy and fairly safe for all.



Floating galena cubes can be found among the loose tailings.

didn't see my first time here: small, water-clear, hexagonal barite crystals on a messy snow-white and carbonate matrix. The crystals were millimeter-scale, but it still got me excited over whether more like these could be found.

After some more searching turned up fruitless, I took my clear cluster to the car pile, where I almost stepped on a trio of inch-scale, translucent calcite rhombs! The biggest one was roughly 2 inches by 1.25 inches, but was marred with milky, weathered surfaces, while the two smaller rhombs showed more transparent surfaces.

I then started making my way across the open flat to see how the wife was doing. She was busy hammering on the biggest boulder in the field, hoping to find a hidden lucky sulfide treasure (lucky as in we did not have a 15-pound sledgehammer or a long crowbar to effectively work with monster boulders)! Her efforts produced a petite, $\frac{1}{3}$ -inch galena cube perched in a mixed carbonate-barite matrix, complete with two triangular corners. While I admired the mineralogical prize, she bent down to a small bush behind me and presented a handful of larger, freeform galena cubes measuring in the 2-inch range. The cubes were a matte gray, and I could definitely tell they were not extracted from any boulder interiors. Still, in my opinion, any galena crystals found in any form are fascinating!

After helping haul her finds back to the car and making a second pile, we decided to re-join forces and explore near the four-way trail intersection, with all the off-paths covered in foliage. Like a dart, she took off for one of the corners, almost like she knew something hidden was near. While hammering was going on, I started to walk briefly down the three paths, searching for potential outcrop targets.

I had just started down the second path when I heard my name called rather loudly

and excitedly. I rushed over to my wife to find that she had broken open a smaller boulder and revealed the most lustrous galena cube I have ever encountered in the field! We took turns chipping out a reasonable matrix piece, while leaving the shining cube undamaged. Our mission was accomplished as we chiseled out an intermixed carbonate-barite matrix piece with a cube measuring 1.25-inch on an edge. It resides on a bookshelf as a field trophy piece.

It became clear that this was the potential spot to hit good sulfide mineralization. We removed a few more freeform galena crystals from the "trophy boulder", as well as the ground outcrop we were sitting on. After some more smashing, Rebecca asked me if my thesis advisor had found any sphalerite on our first visit. I said that we could not find any, to which she replied, "You said that sphalerite can be a root beer/dark-red color right?" I concurred, and then she pointed to a spot saying, "Is it this he was looking for?"

After a second, I was taken quite aback for a couple reasons: first, that she found what couldn't be found during my first trip with my advisor, and second, that she seemed to have quite an affinity for zinc. It was not long ago that we had traveled to the Keokuk, Iowa, area for geode hunting. During that trip, she seemed to find all the geodes containing "black-jack" sphalerite.

After our trip to the Gollar mine, I presented the small, anhedral sphalerites to my advisor, who showed quite a bit of surprise. It was then that he said, "If I ever have a need to go out to find sphalerite, I'll be sure to ask your wife to come out with us to help sniff them out!"

We worked around this corner spot until it was time to start calling it a day. As we traversed the open field back, I noticed another sizeable boulder nearly at the opposite end where Rebecca was initially. Thinking

to myself "Why didn't I notice this before?" I had to take a quick peek. The first thing I noticed was a small, blackish streak coming out of a fracture. Upon closer inspection, it seemed to have some faint glimmer to it. Naturally, I decided to pry to crack open. Given the soft nature of the host rock mineralization, it definitely did not take long to reveal a nice-size mass of drusy chalcocite (peacock ore).

The specimen consisted of millimeter-scale granular crystals, with shimmering blue and green hues that contrasted very well with a snow-white barite matrix. Since we did not have any bigger tools to work the boulder with, and there was a noticeable lack of other easy fractures to pry open, we decided to call it a day. With the appreciable amount of galena and barite we had collected, I was somewhat surprised that our little sedan did not bottom out!

The Gollar mine is a wonderful place for both the seasoned and beginning rockhound. My advisor still takes his introductory-level earth resources classes here, and from what I have heard, his students always have a blast. Although the entrance to the site can be a little rough, access is still easy with a two-wheel-drive vehicle.

To reach the Gollar mine site from Columbia, take U.S. Highway 63 south to Jefferson City. From there, get on U.S. Highway 54 toward Eldon for roughly 20 minutes to the exit for state Route 17 (toward Eugene/Fort Leonard Wood). Make a left off the exit and go for a mile, and then make a left on road BB.

Continue on BB for roughly 2.5 miles, and Swift Road will be on the right. As you turn to get on Swift, there will be a dirt road at an angle behind you, as of the roads make a "wide V". Continue down the dirt road for approximately 0.35 mile until you reach the pit lake to the left and the open collecting area in front. 💎

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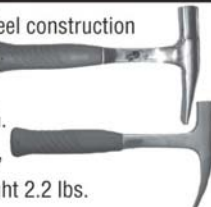
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Show Dates from page 51

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17-19—ALPINE, TEXAS: Show and sale; Chihuahuan Desert Gem & Mineral Club, Alpine Civic Center; 801 W.Holland Ave. (Hwy.90); Fri. 9:00 am-6:00 pm, Sat. 9:00 am-6:00 pm, Sun. 10:00 am-4:00 pm; FREE Admission!; contact Judith Brueske, PO Box 1111, Alpine, TX 79831, (432) 244-9503; e-mail: jbrueske@sbcglobal.net

18-18—SEVERNA PARK, MARYLAND: Annual show; Patuxent Lapidary Guild, Earleigh Heights VCF Fire Hall; 161 Ritchie Hwy.; Sat. 10-5; adults \$1, children (under 10) free; "Kids' Corner"; dealers, fossils, minerals, cabochons, rough rock and slabs, jewelry; contact Donna Madej, 181 Chelsea Rd., Pasadena, MD 21122, (410) 215-1774; e-mail: littlewings@mdonline.net; Web site: www.patuxentlapidary.org

18-18—STILLWATER, OKLAHOMA: Rock swap; Oklahoma State Council of Mineralogical Societies, Couch Park pavillion; 12th Ave & Perkins Road; Sat. 10:00am-4:00pm; Admission is Free; Like us on Facebook; contact Dave Leininger, 14029 Whiye Oak Lane, Bentonville, AR 72712, (479) 721-1579; e-mail: hulagrub@aol.com; Web site: www.oklahomamineralsocieties.org

18-19—STANDISH, MAINE: Annual show; Maine Mineralogical and Geological Society, Saint Joseph's College; 278 Whites Bridge Road; Sat. 10 am-5 pm, Sun. 10 am-4 pm; Adults \$4, Seniors \$3, Students \$3, Children are free; Our 32nd Show! Breathtaking, one-of-a-kind mineral specimens, fossils, beads, and jewelry from renowned local and international dealers. Hourly door prizes and four exquisite Grand Prizes! Special features for the kids, including educational programs (Magic Rocks, Dinosaurs & Fossils, Amazing Crystals, and Buried Treasures of New England), the Mini-Mine, and our Spin Wheel. Live gold-panning and stone-cutting demonstrations. Delicious concession stand food as well! This is the biggest show of its type in the State—definitely a must-do event! See our website for more information, including discounts on admission.; contact Steve Bridge, (207) 893-7953; e-mail: sbridge@sjcme.edu; Web site: mainemineral-club.org

18-19—PINECREST, FLORIDA: Show and sale; Miami Mineralogical and Lapidary Guild, Evelyn Greer Park; 8200 SW 124 Street; Sat. 10:00 am-6:00 pm, Sun. 10:00 am-6:00 pm; Adults \$4.00, Seniors \$4.00, Students \$4.00, Children Free; MMLG Spring GEM, MINERAL, FOSSIL, AND JEWELRY Show at Evelyn Greer Park - just half-a-block off US 1 in Pinecrest - with plenty of free parking. There will be exhibits, demonstrations, displays, raffles, and vendors - as well as educational activities for both children and adults: jewelry-making, grab-bags, gem mining, geode splitting.; contact Sandy Mielke, 2434 Swanson Avenue, Miami, FL 33133, (305) 858.6967;

e-mail: webguy@mmlg-inc.org; Web site: www.miamirockandgem.com

18-19—KENNEWICK, WASHINGTON: Annual show; Lakeside Gem & Mineral Club, Benton County Fairgrounds; 1500 South Oak; Sat. 10-5, Sun. 10-4; adults \$5, children (12 and under) free; dealers, demonstrations, silent auction, junior activities, door prizes, displays; contact Mary Lou Omstead, PO Box 6652, Kennewick, WA 99336, (509) 783-2798

18-19—DECATUR, ILLINOIS: Annual show; Central Illinois Gem & Mineral Club, Progress City - Lester Building; One College Park; Sat. 9 am-6 pm, Sun. 10 am-4 pm; Adults \$5, Seniors \$3, Students under 15 are free, Children are free; The 64th Annual Mineral, Gem & Jewelry Show will be April 18-19th at a new location this year! The show will be at the Lester Building in Progress City, north of the campus of Richland Community College, in Decatur, from 9 am to 6 pm on Saturday, and 10am to 4pm on Sunday. Merchants will showcase jewelry, gemstones, beads, fossils and mineral specimens, along with demonstrations and exhibits. Free activities for kids include a fossil dig and silent auctions will run all weekend. Admission is \$5.00, and is good both days. Seniors 59 and up are \$3.00 Children under 15 are FREE and military persons in uniform are free. Parking is FREE. For information call 217-233-1164 or cigmc@comcast.net; contact Tony Kapt, 1483 E Wood St, Decatur, IL 62521, (217) 233-1164; e-mail: cigmc@comcast.net; Web site: www.cigmc.earthinsync.com

18-19—LANCASTER, PENNSYLVANIA: Annual show; North Museum of Nature and Science, The Farm and Home Center; 1383 Arcadia Rd.; Sat. 10-6, Sun. 10-5; adults (12 and over) \$5; door prizes, educational demonstrations and lectures, children's activities; contact Alison Mallin, 400 College Ave., Lancaster, PA 17602, (717) 358-7188; e-mail: amallin@northmuseum.org

18-19—EAU CLAIRE, WISCONSIN: Annual show; Chippewa Valley Gem & Mineral Society, Eau Claire County Expo Center; 5530 Fairview Drive; Sat. 9:00 AM-5:00 PM, Sun. 10:00 AM-4:00 PM; Admission is FREE, Free, Free, Free; Kids' Activities & Crafts - Demonstrations - Shopping - Silent Auction - Fluorescent Mineral Displays - Rock Collections - Rock Spheres Demonstration - Wire Wrap Jewelry - Rock Cutting & Cabbing - Jewelry & Gemstones - Mineral Specimens - Agates & Geodes - Fossils & Petrified Wood - Rock Art & Carvings - Beads & Supplies - Copper & Silver Finds - Crystal & Amethyst - Books & Rough Rock - (Near the corner of I-94 & Highway 93); contact Paul Tubbs, 619 Van Buren Street, Eau Claire, WI 54703-6061, (715) 834-5747; e-mail: bizpam1@charter.net

18-19—IDAHO FALLS, IDAHO: 51st Annual Gem and Mineral Show; Idaho Falls Gem and Mineral Society, Idaho Falls

continued on page 66



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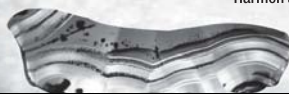
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under 12 free; contact Tom Strong, PO Box
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18-19—SAN JOSE, CALIFORNIA:

Annual show; Santa Clara Valley Gem & Mineral
Society, Santa Clara County Fairgrounds; 344
Tully Road; Sat. 10:00 am-5:00 pm, Sun. 10:00
am-5:00 pm; Adults \$6.00, Children Under
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18-19—WALNUT CREEK, CALIFORNIA:

Show and sale; Pacific
Crystal Guild, Civic Park Community Center;
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18-19—THOUSAND OAKS, CALIFORNIA:

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24-26—IRVINE, KENTUCKY: Annual
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24-26—GRANTS PASS, OREGON:

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24-26—VIRGINIA BEACH, VIRGINIA:

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Show Dates from page 66

24-26—PORTLAND, OREGON: 58th Annual Rock and Gem Show; Mt. Hood Rock Club, Kliever Memorial National Guard Armory; 10000 NE 33rd Drive, (just west of the PDX airport between NE Marine Dr. & NE Columbia Blvd.); Fri. 10-5, Sat. 10-5, Sun. 10-4; FREE - Donations appreciated!; one free rock for each child. 25 Vendors will be selling: minerals, rocks, beads, jewelry, fossils, crafts, equipment, tools and more. Activities will include: Kid's corner with games, Door prizes, Raffle prizes, Demonstrations in lapidary & wire wrapping, Silent auction bargains, Oral auction on Sunday at 1pm. Many Displays and Exhibits. ; contact L. Smith, 503 760 1825; e-mail: mhrshow@gmail.com; Web site: www.Mthoodrockclub.com

24-26—DENVER, COLORADO: Wholesale and retail show; Martin Zinn Expositions, LLC, Ramada Plaza-Denver Central; 4849 Bannock St.; Fri. 10 am-6 pm, Sat. 10 am-6 pm, Sun. 10 am-5 pm; Admission is Free; contact Regina Aumente, PO Box 665, Bernalillo, NM 87004, (505) 867-0425; e-mail: mzexpos@gmail.com; Web site: www.mzexpos.com

25-26—TROY, OHIO: Annual show; Brukner Gem & Mineral Club, Miami County Fairgrounds; 650 N. Co. Road 25A; Sat. 10-6, Sun. 10-4; adults \$2, students and children free; dealers, grab bags, demonstrations, gold panning demonstrations, gem sluice, crystals, jewelry, rocks, fossils, silent auction; contact Judy Burton, 912 Kent Lane, Troy, OH 45373, (937) 339-1966; e-mail: jleeburton@woh.rr.com; Web site: www.bruknergemand-mineralclub.com

25-26—ELMA, WASHINGTON: 47th annual Earth's Treasures Rock and Gem Show; Grays Harbor Gem and Geology Society, Grays Harbor County Fairgrounds; 43 Elma-McCleary Road; Sat. 10 am-5 pm, Sun. 10 am-4 pm; Admission is FREE!; contact Gary Emberley, 624 Fairmont Place, Aberdeen, WA 98520, (360) 533 6196; e-mail: melissa624@hotmail.com

25-26—SEATTLE, WASHINGTON: 49th annual show Earth's Treasures; West Seattle Rock Club, Alki Masonic Temple; 4736 40th Avenue SW; Sat. 10 am-5 pm, Sun. 10 am-5 pm; Admission is Free; contact Leroy Christensen, (206) 582 2267; e-mail: soundviewathome@comcast.net

25-26—CUYAHOGA FALLS, OHIO: Semi-annual show; Akron Mineral Society, Summit Lapidary Club, Emidio & Sons Expo Center; 48 E. Bath Rd.; Sat. 10-6, Sun. 10-5; adults \$5, seniors and students \$4, children (under 6) and Scouts in uniform free; 30 dealers, geodes, minerals, jewelry, beads, findings, slab material, lapidary equipment, silversmith work, gold findings, children's activities, gem tree making, gem mine, kaleidoscope, treasure hunt, demonstrations, gem ID, wire wrapping,

continued on page 79

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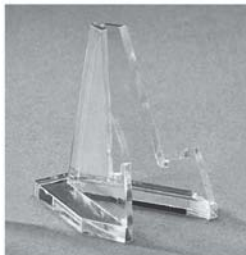
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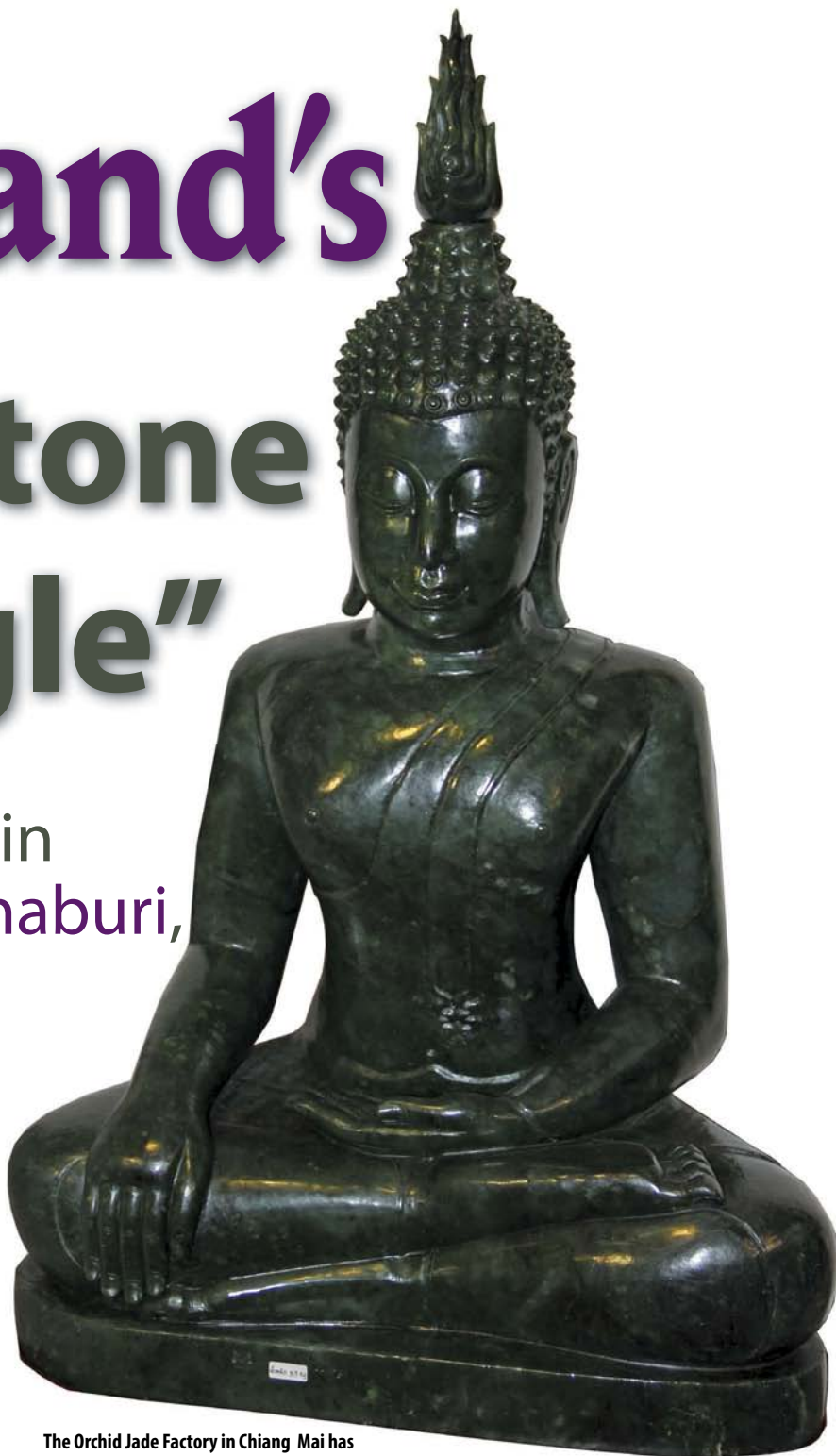
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Thailand's "Gemstone Triangle"

A Colorful Trade in
Bangkok, Chanthaburi,
and Chiang Mai

Story and Photos by Jim Brace-Thompson

When my wife, Nancy, and I planned a trip to Thailand at the end of November 2013, we were already familiar with the fabled gem market of Chanthaburi; it is said that 85% of the world's rubies and sapphires pass through it. Because we were traveling with non-rockhound friends Mark and Lynne, who prefer yoga and baseball to gemstones, I was allowed just one stop for rocks in this little corner of Thailand.



The Orchid Jade Factory in Chiang Mai has produced jade Buddhas for temples throughout Thailand.

The rest of our itinerary was given over to cultural spots like the grand ruins of Ayutthaya, a UNESCO World Heritage Site and capital of the Thai Kingdom for 417 years before being sacked by a Burmese army in 1767. It was one of the largest cities in the world at a time when the United States was not yet united and constituted a mere colonial backwater.

As our travels progressed, however, we soon learned that Chanthaburi, located in southeast Thailand, was but one point of a Thai "gemstone triangle". By happy coincidence, the two other points fell right smack on our itinerary: Bangkok, in the south-central part of the country, and Chiang Mai, in the far north. Thus, our trip was to prove far more connected to rockhounding than we had planned.

The name Chanthaburi means "Moon City", and it sits scenically on the Chanthaburi River, which flows out to the resort beaches on the Gulf of Thai-



Middlemen negotiate with buyers, who set up tables in the gem market.



A craftsman at the Orchid Jade Factory sculpts lavender Burmese jade into an elephant.

land. In other words, it is a gorgeous destination! Chanthaburi Province borders the Gulf of Thailand to the south and Cambodia to the east, and the mountains to the north are rich in rubies and sapphires, as well as tropical fruit. Our guide shared some of that fresh fruit with us, swinging our van by his family farm to visit with his auntie and reverently leading us to his ancestral graves.

Given its location and the value of its natural resources, Chanthaburi is something of a crossroads and has been occupied at various times by the Cambodians, Vietnamese and French, and that crossroads setting shows in the diversity of the city. While most of Thailand is fairly homogenous (75% to 95% ethnic Thai and 95% Buddhist), in Chanthaburi, you'll see streets that look like France or New Orleans, a Catholic cathedral in addition to Buddhist temples, and faces from around the world.

One reason for that diversity is Chanthaburi's vibrant, wheeling-dealing, outdoor gem market, centered on Si Chan Road. Every Friday, Saturday and Sunday, buyers come, book a table, and place a sign (in Thai) indicating what sorts of stones they're seeking. Sellers, who are actually middlemen for the owners of the stones, then circulate among the tables with backpacks, fanny packs, and shoulder purses, from which they pull zip-lock baggies filled with faceted stones: sapphires, garnets, amethysts, emeralds, aquamarines, citrines, tourmalines and others. Your eyes pop when you see a rather humble-looking person pull a bag of cabbed star rubies from a rag-tag fanny pack and pour the glittering jewels across a table.



Chanthaburi hosts a vibrant open-air gemstone market every weekend.

A local tradition of cutting, cabbing and faceting stones has been passed down through generations of families. The skill and affordability of labor in the town have made Chanthaburi a world center for sending rough stones to be cut and marketed. It's also the traditional gemstone-mining district of Thailand, although it's said that the local ruby and sapphire mines are about tapped out. This accounts for the shift to cutting and faceting stones that are sent here from around the world.

As for making a purchase at the street market, well, we were there as looky-loos.

We had been forewarned by two friends in the gem industry who had Thai roots that deal-making was "not for the uninitiated" and that a person seeking to buy a single small stone wouldn't be worth the seller's time or bother. Big-money deals were the focus in those humble street stalls, and if you wanted to participate, you had better be serious. This idea was illustrated by a message scrawled on a wall that our guide interpreted for us as, "Nothing good is cheap".

We saw a couple German buyers who apparently took that saying to heart and



"Golden noodles" hang in shop after shop in Bangkok.

who must have brought a bundle of Euros with them in leather satchels, which they held close to their chests. Their table was swamped with would-be sellers out to negotiate deals. Still, while we didn't purchase a gemstone, we walked away with a treasure chest filled with photos and exciting memories.

Compared to the exotic tropical charm of Chanthaburi (population 27,602), Thailand's capital of Bangkok is a modern high-rise city of some 8 million people—22 million when including the surrounding communities that have merged into the greater megalopolis. It is famously flooded periodically by the Chao Phraya River, the main river in Thailand that cuts down the center of the nation like the Mississippi River in the United States. If you're brave enough to board a small boat and take a river tour of the Chao Phraya, you'll not only pass gigantic river komodo dragons, but canals, gates and locks intended to hold back the waters. Bangkok truly is a water city and is sometimes called the Venice of Southeast Asia. (Then again, so are about a half dozen other Asian cities.)

In addition to these titles, Bangkok has been dubbed "the gemstone capital of the world". It's become an international distribution hub for gemstones and gold and silver jewelry, wholesale and retail. Tourists are often advised that the upscale Peninsula Plaza is the best place to go for jewelry shops, but it's also the best place to deplete a wallet.

Beyond the Plaza, you'll find whole blocks dedicated to the sale of loose and set gems, most famously rubies and sapphires. This is the Bang Rak district of central Bangkok, around the intersection of Si-lom and Mahesak roads, near Chinatown. In this same vicinity, you'll find blocks dedicated to the sale of silver and gold. Thai gold and silver jewelry is generally considered of a high standard, and shops overflow

The Language of Bargaining

The baht is the Thai currency. Because of political instability, its value is highly variable, so check the exchange rate before your trip. In high-end malls, prices are fixed, but bargaining is expected in street stalls and shops, especially since marked prices are often double what the vendor will accept. One of our guides suggested starting at 60% off the marked price, except for items that are already at low prices. But she also said not to start bargaining unless it was an item you really wanted. Apparently, it is bad form to haggle but not follow through. Still, she did suggest the strategy of beginning to walk away, which often quickly lowers the price to your desired range. To assist you in bargaining, following are Thai phrases related to buying. Pronunciation guides, both simple and highly detailed, can be found online, including www.thailao.net/thaiphon.htm and www.lingvozone.com/Thai.

Hello

sa-wùt dee (usually said with hands pressed together as if in prayer)

I would like ...

dtông-gahn ...

How much does this cost?

nêe rah-kah tào-rài

Expensive ... could you lower the price?

pairng ... lôt rah-kah nòi dài mòi

Do you take credit cards?

rub but cray-dit

Yes.

chài or krúp/kà

No.

mài chài or mài krúp/kà

Thank you.

kòrp-kOOn

No, thank you.

mài ao kòrp-kOOn

Goodbye

lah gòrn nà



A tree has wrapped around a stone carving of Buddha in historic Ayatthaya, the ancient capital of the Thai Kingdom.



Happy customers make for happy sellers in Chanthaburi's open-air gem market.

with racks of gold chains. Grouped densely next to one another, they're called "golden noodles" by the locals.

However, *caveat emptor*! Per one guide-book we consulted, the selling of fake or inferior jewelry and gemstones to foreigners has become a well-developed scam in Bangkok. As the saying goes, a sucker is born every minute, and Bangkok is populated with hustlers well acquainted with that maxim.

Unless you know what you're looking at, don't be taken in by a gemstone deal that seems too good to be true. Besides, if you're a retail buyer, you're likely to be hit with retail prices on par with those in any major world city. Also beware of locals who try to befriend you and offer to take you to shops offering great deals. There are many "confidence men" operating under commission from complicit shop owners.

Since we weren't hungering to make a purchase, we had a great time just window shopping and gawking at shop after shop full of gemstone and lapidary wonders. It was like Tucson times twelve! And eventually we did end up putting a sapphire ring on Nancy's finger. At least, we hope it's sapphire and not blue glass.

The downside of Bangkok, while we were there, was the little revolution that broke out, with 100,000 demonstrators try-



Spectacular gems spill across tables every weekend in Chanthaburi.

ing to topple the government. Sections of the city around government buildings became war zones, cordoned off with razor wire and defended with tear gas and rubber bullets. Our itinerary had to be quickly adjusted, and by the time we left, at least

four people had died and hundreds had been injured, and still the fighting continued with just a brief hiatus out of respect for the king's birthday.

King Bhumibol Adulyadej (or simply Rama IX) has served since 1946, mak-

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A down side to our Thai visit was a coup that brought police into the streets.

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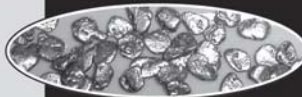
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ing him the longest-reigning monarch of any country. He's of the same generation as Queen Elizabeth II and is revered and considered inviolable. Having encouraged and supported numerous public welfare projects, he is respected by Thais across the political spectrum and has been the one sure source of stability for nearly 70 years.

I learned that since the end of absolute monarchy in 1932, Thailand has seen 11 successful and seven attempted military coups. The violence taking place while we were there eventually led to the twelfth successful coup after we returned home. They've had more military coups than any other country in contemporary times, so apparently this situation was not unusual, but learning that history certainly did not make us feel any more comfortable while we were there. Still, most Thais in the capital seemed to take it in stride, going about daily life while eying television sets in shops for unfolding events.

We also heard that the Russian mafia has established itself in Thailand and is increasingly changing the face of any enterprise with potentially big profits to be made, including gemstones. Not being huge fans of big, crowded cities anyway, we weren't overly reluctant to leave as we headed to a train station, making our way through a phalanx of incoming protestors for the night train to Chiang Mai.

Normally, a 15-hour narrow-gauge train ride through pastoral countryside, winding past mountains and quaint farms and villages, concluding with a gorgeous sunrise through morning mist, would be considered idyllic. Not so for Nancy, who endured the entire trip with food poison-



100,000 protestors flooded Bangkok, eventually toppling the government.

ing from our dinner at the very start of the ride. Happily, upon her recovery, we found ourselves a whole peaceful world away from Bangkok in the hill country of Thailand's far north.

Like Chanthaburi, Chiang Mai has become a center for precious gemstone cutting. Even more so, it's known for the carving and crafting of fine jade from the nearby Burmese jade-mining district, including a gorgeous lavender jadeite.

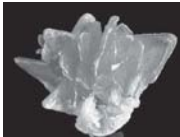
It wasn't on our schedule, but when our guide heard of my interest in gems, she launched into a lecture about local jade carving and adjusted our itinerary on the spot, arranging a tour of the Orchid Jade Factory, which has crafted spectacular large jade Buddhas for temples.

In addition to the showroom, they took us behind the scenes to see craftsmen carving jade in shades of green, yellow, orange, lavender, white and black. That black jade turned out to be a very dark shade of green, visible when they shone a powerful light from behind a cab. When we arranged our itinerary, we had given Chiang Mai short shrift, but based on the little we saw, if ever again we get to this part of the world, it's Chiang Mai that we'll target. Next time, though, I think we'll fly in so Nancy can avoid the evening train dinner!

Chanthaburi, Bangkok, and Chiang Mai: Although each is quite different in setting and character, each has become a respected international center of gemstone cutting, favored for low cost of labor and generations of experienced craftsmen. If you ever have the opportunity to visit Southeast Asia, be sure to hit each of these three points on Thailand's "gemstone triangle"! 💎

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Mineral Nomenclature

One part of our hobby that we take for granted is mineral nomenclature, or the naming of minerals. Due to the long history of mineralogy and the worldwide occurrence of minerals, the names we already have are a mixed bag. Some are based on ancient terms in languages other than English, while others are named after accomplished individuals.

Adding to the confusion are those minerals that have been named by individuals who think they have discovered something special and wish to capitalize on it. This is particularly true in the lapidary field, where names are chosen more for marketing purposes than scientific meaning. Consider Biggs, Deschutes, and Stone Canyon jasper, names that refer to the locations in which they are found; citrine, amethyst, smoky and rose quartz, named for their color; and banded, fortification and eye agate, named for their patterns. There's nothing wrong with that, since the labels help us describe the specimens.

Minerals were well known in the ancient world. In fact, mineralogy—in its broadest sense—is one of the oldest sciences. Seventeen minerals are listed in *San-Hey-Din*, a Chinese book that dates to about 500 BCE.



To indicate that galena (lead sulfide) contains sulfur, its chemical name ends with **-ide**.

The Greek philosopher Theophrastus (372-287 BCE) was the first to write about minerals in the Western world. He listed 16 in his book *Peri Lithon* (About Stones).

Mineralogical knowledge remained quite secret until the mid-1500s, when German scientist Georg Bauer (Georgius Agricola in Latin) wrote a book titled *De Re Metallica*, with details about minerals, ores and mining. Even Leonardo De Vinci wrote a treatise on the properties of minerals.

In the Roman world, Latin became the common language of the sciences.

On the periodic table, some elements are represented by a letter or letter combination taken from their Latin names. These include the elements gold (*aurum*, Au), silver (*argentum*, Ag), antimony (*stibnium*, Sb), tin (*stannum*, Sn), lead (*plumbum*, Pb), and mercury (*hydrargyrum*, Hg).

Some of these Latin names have carried over into the names of some more recently discovered minerals that contain one of these elements. Stibnite, for instance, is an antimony mineral and stannite is a tin mineral. *Plumbum*, meaning lead, carries over into English in the word "plumbing", based on the early use of lead for water pipes.

Today, when a new mineral is confirmed, the person who made the discovery has the honor of choosing a name for it. This name is submitted to the Commission on New Minerals, Nomenclature and Classification (CNMNC), a branch of the International Mineralogical Association (IMA) that was created to standardize the terminology used by scientists around the world. It is up to the commission to approve the choice based on rules that have been developed and practiced over decades.

The field of chemistry also has ancient roots, but was kept in secrecy until the Age of Enlightenment. Mineralogy has a strong connection with chemistry, so both have had a strong influence on mineral naming. Chemistry uses certain word endings to signify the presence of oxygen (-ate) or sulfur (-ide) in a compound. The compound crocoite (PbCrO_4) is called lead chromate, while galena (PbS) is a lead sulfide.

The suffix **-ite**, which is of Greek origin, is used to refer to types of stone, as in meteorite or kimberlite. We use the same ending for some minerals, like hematite and torbernite. Less commonly used is the suffix **-ine**, also borrowed from chemistry. We see it in mineral names like chalcosine, aegerine and aventurine.

We still use ancient words for minerals like quartz, gypsum and opiment. Quartz was called "silex" in Roman times, and that name persisted into the 1700s. It is seen in some books of that era. The Germans came up with the name "quartzum", which eventually became "quartz". The Romans called gypsum "lapis specularis", but they also had other names for it. Eventually, the mineral became known as "gips" or "gyps". Varieties like selenite and alabaster were called "marienglas" and "alabastrum". In early Germany, realgar was "rauschgelb"



Editor Bob Jones checks the underground site where bobjonesite was first found in a petrified log.

and orpiment, its close relative, was known as “auripigmentum”. Thank goodness these names have changed for the better!

Locality names include almandine, which refers to the town Alabanda, in Asia Minor, where garnets were found in ancient times. Every lapidary knows that the word “agate” came from the early agate source known as Achates, a river in Sicily. The common calcium carbonate aragonite was originally named “aragonischer” for the source in the Aragon region of Spain. Bisbeeite is named after the town Bisbee, Arizona; benitoite is from San Benito County, California; and californite is named after the state.

Before 1783, naming minerals for people was not in practice. That year, famous mineralogist Abraham Gottlob Werner identified a new mineral and named it for Colonel Hendrick van Prehn, who first found it. Prehnite is a hydrous calcium aluminum silicate.

Werner was the lead proponent of one of two opposing scientific philosophies. Werner believed almost all minerals and rocks originated from surface waters. James Hutton was of the opinion—which proved to be correct—that rocks and minerals are primarily of igneous origin.

Today, it seems that as many new minerals are named for people as for any other reason. Some of the names seem quite awkward to me. Take the mineral hydrous vanadate sulfate, or bobjonessite, which is named for this writer. That really is an honor, but it still strikes me as a bit awkward for a mineral name. What is really funny is that, when I would be giving a talk about a mineral with such a name, I’d make negative comments about naming minerals for people. I can’t do that anymore!

In checking the section on nomenclature in an old *Dana System of Mineralogy* from the 1800s, I found that, originally, minerals were only named for people when they had made some contribution to the science, but had no children. This helped the person’s name live on, as it were. Such is not the case with bobjonessite!

Today, the naming of minerals is governed by useful guidelines. In 1958, a group of scientists and mineralogists organized the IMA. Their goal was to organize the classification and naming of new species. A subcommittee, the Committee on New Minerals and Mineral Names (CNMMN), was formed, and it developed an orderly procedure for identifying and naming new mineral species.

A mineral that is suspected to be new is submitted to the committee. Tests are then made to establish its validity as a distinct species. The mineral is then named and added to the valid mineral roster. An up-to-date listing of all minerals, *Fleischer’s Glossary of Mineral Species*, is available from www.MineralogicalRecord.com.

When bobjonessite, a hydrous mineral, was first submitted, it was proved to be a distinct species and was given the status of a new, unnamed mineral. However, second-stage testing revealed that the test



Prehnite was the first mineral ever named for a person, Colonel Hendrick van Prehn.

specimen had lost water molecules and was no longer what it had been originally identified as. So, additional samples had to be submitted, this time sealed so there was no loss of moisture. The second test proved that bobjonessite was a new and valid mineral. I keep the specimens I collected under conditions that ensure no moisture is lost, so they remain valid.

The IMA also established a Committee on Mineral Classification (CMC), which was later combined with the CNMMN, and today this joint committee has the total responsibility of identifying and naming new minerals. They also have the responsibility of examining known minerals and deciding if they are properly named and categorized. Some minerals whose names have long been in use have been re-assigned a name that is based on their chemistry.

A case in point is endlichite, a lovely, mahogany brown, lustrous mineral found abundantly years ago at Los Lamentos (Chihuahua), Mexico. It was always thought that endlichite was related to vanadinite, but was richer in arsenic and therefore worthy of its own name. The CNMMN examined endlichite, decided it was more vanadinite than endlichite, and assigned it a new position and the name “arsenian vanadinite”. It’s not easy for us old dogs to accept such change, valid though it may be.

Though my interest in minerals began around 1935, I did not seriously collect until after World War II. At that time, I believe there were something fewer than 3,000 known mineral species. With the arrival of X-ray diffractometers a few years after World War II, however, we could better identify unknown minerals, and this number increased dramatically.

The use of X-rays to identify minerals—the first really reliable method that did not destroy the specimen—was developed by German scientist Max von Laue around 1912. The X-ray diffractometer shoots a beam of radiation into a specimen, and the

resulting patterns captured on film can be compared with the patterns of known minerals to determine whether the mineral is a known compound or a new one.

Today, we are approaching 5,000 valid mineral species, and the number is growing. A new piece of equipment that will really trigger more additions is something I’ve only seen once: a Raman spectrographic instrument. The remarkable thing about this beauty is that you can touch it to the surface of a mineral and it will read the elemental content of the specimen. Imagine being in the field collecting and being able to determine right there if a mineral deserves further investigation.

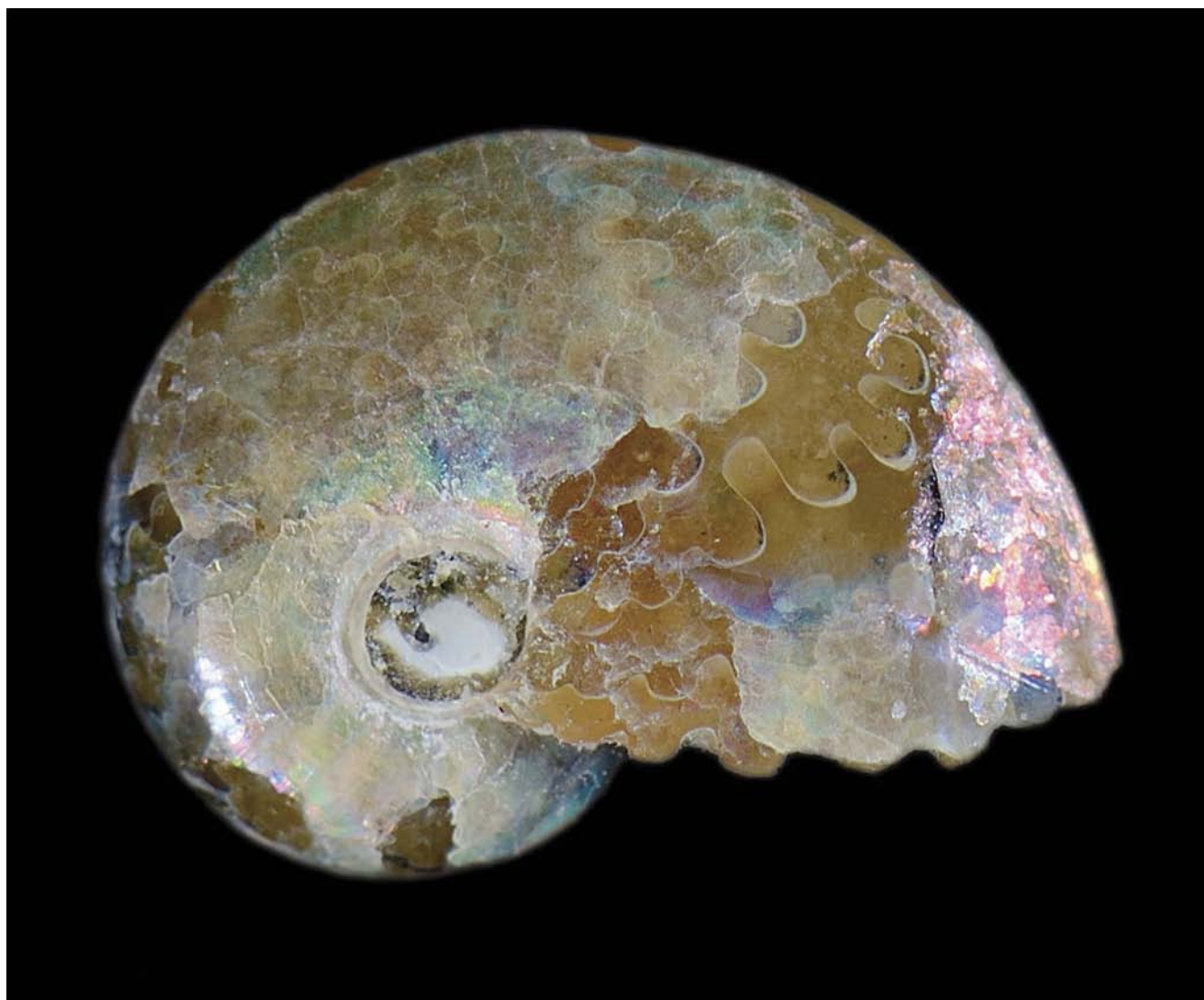
Currently, there is an international organization called the RRUFF™ Project, which is composed of scientists from around the world who coordinate their identification activities using the Raman. Check out the organization online at ruff.info. It’s quite a remarkable program.

What I find most interesting about mineral names and element names and symbols is the history behind them. The evolution of the science from prehistory through the Greek and Roman eras, the alchemists, and into the Age of Enlightenment is absolutely fascinating.

The historical panorama of our hobby is another wonderful facet that expands our enjoyment far beyond the collecting and ownership of minerals. It gives mineral collecting the historical foundation it deserves and gives the collector another fascinating aspect of our hobby that is worth pursuing. 💎

Bob Jones holds the Carnegie Mineralogical Award, is a member of the Rockhound Hall of Fame, and has been writing for *Rock & Gem* since its inception. He lectures about minerals, and has written several books and video scripts.





Ammonite

This ammonite specimen was collected along the Belle Fouché River in South Dakota. It is one of the smallest ammonites (approximately 5 mm).

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